A DISSERTATION ON

"ABDOMINAL TUBERCULOSIS : ANALYSIS OF CLINICAL FEATURES AND OUTCOME OF SURGICAL MANAGEMENT IN ADULT PATIENTS IN RGGGH"

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CERTIFICATE

This is to certify that the dissertation entitled "ABDOMINAL TUBERCULOSIS : ANALYSIS OF CLINICAL FEATURES AND OUTCOME OF SURGICAL MANAGEMENT IN ADULT PATIENTS IN RGGGH" is a bonafide original work of **Dr. S. SELVARAJ**., in partial fulfilment of the requirements for M.S.Branch– I (General Surgery) Examination of the Tamil Nadu Dr. M.G.R._Medical University to be held in APRIL 2016 under my guidance and supervision in 2014-15.

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DECLARATION

I hereby solemnly declare that the dissertation titled "**ABDOMINAL TUBERCULOSIS : ANALYSIS OF CLINICAL FEATURES AND OUTCOME OF SURGICAL MANAGEMENT IN ADULT PATIENTS IN RGGGH**" is done by Me at Madras Medical College & Rajiv Gandhi Govt. General Hospital, Chennai during 2014-15 under the guidance and supervision of Prof.Dr.A.RAJENDRAN, M.S. The dissertation is submitted to The Tamilnadu Dr.M.G.R. Medical University, Chennai towards the partial fulfillment of requirements for the award of M.S. Degree (Branch-I) in General Surgery.

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LIST OF ABBREVIATIONS

TB	- -	Tuberculosis
ATB	- -	Abdominal Tuberculosis
EPTB	- -	Extra Pulmonary Tuberculosis
RIF	- -	Right Iliac Fossa
GI	- -	Gastrointestinal
AFB	- -	Acid Fast Bacilli
PPD	- -	Purified Protein Derivative
HIV	- -	Human Immunodeficiency Virus
USG	- -	Ultrasonogram
CECT	- -	Contrast Enhanced Computed Tomography
ADA	- -	Adenosine De Aminase
CMI	- -	Cell Mediated Immunity
PCR	- -	Polymerase Chain Reaction
DOTS	- -	Directly Observed Treatment Short Course
HAART	- -	Highly Active Anti Retroviral Therapy

ABSTRACT

ABDOMINAL TUBERCULOSIS : ANALYSIS OF CLINICAL FEATURES AND OUTCOME OF SURGICAL MANAGEMENT IN ADULT PATIENTS IN RGGGH

INTRODUCTION

Tuberculosis is one of the most prevalent communicable disease in India. Despite several populistic measures to control the spread of tuberculosis and to improve upon the early identification of patients and proper management protocols, the disease continues to be rampant. With the advent of the multi drug therapy regimen the incidence of pulmonary tuberculosis and mortality due to the same has reduced. But at the same time extra pulmonary form of tuberculosis is on the rise. In spite of considerable advances in recent times, tuberculosis, particularly of abdomen, still continues to be a major health problem in India. Abdominal tuberculosis (ATB) is a great mimic and an importantcause of morbidity

AIMS & OBJECTIVES

1. To study the various clinico-pathological manifestations of abdominal tuberculosis.

2. To study the various factors determining the surgical management of abdominal tuberculosis
3. To study the various surgical treatment modalities, their complications & outcome in the management of abdominal tuberculosis.
4. To correlate the clinical, imaging and histopathological features

MATERIALS & METHODS

Its a prospective and retrospective observational study. Method of sampling was non-random, purposive. Those patients whose imaging, intraoperative findings or histopathology was suspicious of tuberculosis were included in the study. Informed written consent was taken from the patients or their guardian willing to participate in the study. Detailed history was taken from the study group to establish proper diagnosis. Thorough physical examination was done in each case. Data collection sheets were filled in by the investigator himself. The operation procedure and related peroperative factors were observed directly and recorded in

the data collection sheet instantly. After completing the collection of data it was compiled in a systematic way and analysed

RESULTS & DISCUSSION

The incidence of abdominal tuberculosis causing acute abdomen and requiring emergency millie laparotomy is on the rise. The common procedures performed included primary closure of perforation incase of small isolated perforations with not much contamination. Resection followed by either anastomosis or stomas was done in most of the patients. Even in those patients who had anastomosis, a covering stoma was placed as the healing process in these patients may be impaired. The prevalence of morbidity in these patients were similar to any group of patients undergoing emergency laparotomy. There was no age or sex predilection. Presence of a systemic disease and immunocompromised patients had increased tendency to develop post operative morbidity and mortality. Overall, prognosis is good in patients provided with early intervention, intensive post operative management while ensuring the completion of course of anti tubercular drugs.

CONCLUSION

1. Abdominal Tuberculosis should be a part of the differential for patients presenting with acute abdomen
2. Identification of the disease in its early stages, when the patients has only non specific symptoms is essential.
3. In immunocompromised patients or patients with pulmonary tuberculosis, any abdominal symptoms has to be properly evaluated.
4. The prognosis, if properly managed is very good, so proper management protocols need to be established
5. Further large scale studies have to be initiated to determine methods of early diagnosis and to reduce the morbidity of the disease.

CHAPTER 1

INTRODUCTION

INTRODUCTION

1. BACKGROUND

Tuberculosis is one of the most prevalent communicable disease in India. Despite several populistic measures to control the spread of tuberculosis and to improve upon the early identification of patients and proper management protocols, the disease continues to be rampant.

With the advent of the multi drug therapy regimen the incidence of pulmonary tuberculosis and mortality due to the same has reduced. But at the same time extra pulmonary form of tuberculosis is on the rise. The morbidity and mortality due to extra pulmonary tuberculosis is a major strain on the public health expenditure,

In spite of considerable advances in recent times, tuberculosis, particularly of abdomen, still continues to be a major health problem in India. Several recent developments, which have influenced the incidence as well as clinical course of tuberculosis in general, warrant a fresh look at abdominal tuberculosis. The disease is a diagnostic enigma and the management is still controversial. Surgical treatments, both radical and conservative, are being advocated. Approximately one fifth of patients require surgical intervention. Abdominal tuberculosis (ATB) is a great mimic and an important cause of morbidity.

1.2 OBJECTIVES

The purpose of this study is

1. To study the various clinico-pathological manifestations of abdominal tuberculosis.
2. To study the various factors determining the surgical management of abdominal tuberculosis
3. To study the various surgical treatment modalities, their complications & outcome in the management of abdominal tuberculosis.
4. To correlate the clinical, imaging and histopathological features

CHAPTER 2

REVIEW OF LITERATURE

REVIEW OF LITERATURE

2.1 EPIDEMIOLOGY

Abdominal tuberculosis is a most common type of extra-pulmonary tuberculosis, comprising of tuber- culosis of gastrointestinal tract, peritoneum, omentum, mysentery and its lymph nodes and other abdominal organs such as liver, spleen and pancreas. The extrapulmonary tuberculosis involves 11-16% of all patients of tuberculosis out of which 3 to 4% belong to abdominal tuberculosis.

Extrapulmonary tuberculosis is common amongst HIV-infected patients. This co-existence of TB and HIV/AIDS has led to the resurgence of extrapulmonary tuberculosis (EPTB) in the developing and under- developed countries. In various series, extrapulmonary tuberculosis alone or in association with pulmonary disease has been documented in 40-60% of all cases with HIV co-infected individuals. The pattern of presentation of abdominal tuberculosis has dramatically changed with increasing incidence of HIV coexistence, making the diagnosis of extrapulmonary tuberculosis in HIV- infected persons difficult.

Abdominal tuberculosis can mimic a variety of other abdominal conditions/ diseases and only a high degree of suspicion can help in the diagnosis otherwise it is likely to be missed or delayed resulting in high morbidity and mortality.

2.2 Pathophysiology of Abdominal Tuberculosis

Abdominal tuberculosis can occur primarily or it can be secondary to a tubercular focus elsewhere in the body. Gastrointestinal tuberculosis occurring due to ingestion of milk or food infected with Mycobacterium bovis can result in primary intestinal tuberculosis, but it is now-a- days rare. Infection by Mycobacterium tuberculosis causing abdominal tuberculosis is acquired in following ways:

- Dissemination of primary pulmonary tuberculosis in childhood
- Swallowing of infected sputum in active pulmonary tuberculosis
- Hematogenous dissemination from a focus of active pulmonary tuberculosis or military tuberculosis
- Mycobacteria can spread from infected adjacent organs like fallopian tubes
- Intestinal infection can occur by lymphatic spread from infected mesenteric lymph nodes
- Mycobacteria can also get disseminated through bile from tubercular granulomas of the liver.

2.3 ANATOMICAL TYPES OF ABDOMINAL TUBERCULOSIS

Various anatomical sub types of abdominal tuberculosis are,

1. Intestinal tuberculosis

Intestinal tuberculosis is also called as ***Koenig's syndrome***

Ileocaecal and terminal ileal region - most common site

Jejunum and colon - less common

duodenum, oesophagus - rare

Diffuse tuberculous colitis is less commonly seen (4%), mimics ulcerative colitis.

- Ulcerative - 60% incidence in malnourished patients
- Hyperplastic - in patients with poor immunity
- Ulcero-hyperplastic - combination subtype
- Stricture type - predominantly in ileum alone

2. *Peritoneal tuberculosis*

a. Acute.

b. Chronic.

i. Ascitic type.

ii. Encysted (loculated) type.

iii. Plastic (fibrous/adhesive) type.

iv. Purulent type.

3. *Tuberculosis of mesentery and its lymph nodes*.

4. *Ano-recto-sigmoidal tuberculosis*.

5. *Involvement of liver, spleen and other organs as a part of miliary tuberculosis.*

6. *Tuberculosis of the omentum.*

7. *Rare types:*

Oesophageal (0.2% of abdominal tuberculosis)

Gastroduodenal (1% of abdominal tuberculosis)

Retroperitoneal tuberculosis.

2.4 CLINICAL PRESENTATION

In order of frequency, abdominal tuberculosis manifests as tubercular lymphadenitis, peritonitis and hepatosplenic or pancreatic tuberculosis. The disease may present at any age but commonly seen in young adults. In children, peritoneal and nodal form of tuberculosis is more common than intestinal tuberculosis

Clinical presentation may be:

• Acute

• Acute on chronic

• Chronic

Constitutional symptoms:

✓ Low-grade fever, malaise, night sweats, anaemia,

✓ weight loss - Observed in 30% of patients

The clinical manifestations depend on the site and type of involvement.

In specific subtypes:

• *Ulcerative :*

Diarrhoea and malabsorption, intestinal perforation (occasional), Rectal bleeding is rare but reported occasionally in colonic tuberculosis

• *Stricture* :

Recurrent subacute intestinal obstruction (e.g. vomiting, constipation, distention and colicky pain). There may be associated gurgling sounds or feeling of moving ball of wind in the abdomen and visible distended intestinal loops with

visible peristalsis. These symptoms get relieved with passage of flatus / stool. Sometimes, acute intestinal obstruction may develop

- *Hyperplastic* :

  Mass abdomen (RIF) and obstruction

- *Ascites* - generalised distension of abdomen

- *Peritoneal* - abdominal cocoon; vague abdominal pain, parietal peritoneal thickening as doughy abdomen; mass abdomen

- *Mesenteric*—tabes mesenterica, obstruction, mass

- Associated tuberculosis of other organs is seen in 30% of cases

Atypical presentations:

Lower GI bleed, fistula-in-ano, PID like pain, gastric disease symptoms, dysphagia, GI fistulae, perforation.

Solid organ tuberculosis

Tuberculosis of pancreas:

- Like or part of miliary tuberculosis

- Common in immunocompromised

- Usually presents as acute or chronic pancreatitis

• Pancreatic mass or abscess may develop

• Can mimic malignancy

Tuberculosis of liver:

• Miliary type

• Granuloma /tuberculoma

• Like liver abscess/intra-hepatic calcification

• Obstructive jaundice

• PUO/altered LFT

Tuberculosis of spleen:

• Disseminated or miliary form

• Can present as PUO with hepatosplenomegaly

• Can occur as multiple abscess.

A physical examination of abdomen may show signs of ascites, lump in the abdomen or visible peristalsis with dilated loops of gut. However, abdominal examination may be unrewarding in a large number of cases.

Because of varied clinical manifestations, one or the other form of abdominal tuberculosis may mimic any one of the followings:

1. Malignant neoplasms, e.g. lymphoma, carcinoma

2. Inflammatory bowel disease

3. Cirrhosis of the liver especially peritoneal tuber- culosis

4. Ileocaecal mass may mimic appendicular lump or malignancy caecum or other conditions.

A high degree of suspicion combined with proper use of diagnostic modalities will help in the timely diagnosis of the disease.

2.5 DIAGNOSTIC STUDIES

The isolation of acid fast bacilli (AFB) is the gold standard for diagnosis of pulmonary tuberculosis but may not be possible for establishing the diagnosis of various forms of abdominal tuberculosis. So far the diagnosis of abdominal tuberculosis has been made either on the histological evidence of TB in the tissue (e.g. evidence of tubercles with caseation or demons- tration of AFB in a lesion) or typical operative findings suggestive of TB or animal inoculation or tissue culture yielding the growth of M. tuberculosis. Now with the advent of better radio-imaging procedures, new criteria for the diagnosis were suggested by Lingenfelser.

Criteria for Diagnosis of Abdominal Tuberculosis :

i. Clinical manifestations suggestive of TB

ii. Imaging evidence indicative of abdominal TB

iii. Histopathological or microbiological evidence of TB and/or

iv. Therapeutic response to treatment.

INVESTIGATIONS

1. Blood examination may show varying degree of anemia, leucopenia and raised ESR

2. *Serum biochemistry:* Serum albumin level may be low. Serum transaminases are normal. A high level of serum alkaline phosphatase may be observed in hepatic tuberculosis.

3. *PPD skin testing/mantoux test*: This gives supportive evidence to the diagnosis of abdominal tuberculosis in 55 to 70% patients if positive, however, a negative tuberculin test may also be observed in one-third of patients. The test is of limited value due to its low sensitivity and specificity. Both false negative and false positive reactions are common. Negative mantoux test in patients of tuberculosis could be due either to (a) immunosup- pression or malnutrition producing anergy or (b) recent overwhelming tuberculosis or miliary tuberculosis or (c) rarely

circulating mononuclear adherent cells suppressing the sensitized T- lymphocytes in peripheral blood or (d) suppression of PPD-reactive T-lymphocytes. However, a tuberculin test performed later (i.e. after 6-8 weeks) will always be positive in these patients. Positive reactions are also common with quiescent disease or when persons have been sensitized by nontuber- culous mycobacteria or following BCG vaccination.

The results of anergy testing in HIV-infected populations do not help in the clinical diagnosis and in decision making about preventive therapy.

4. Imaging Techniques:

Plain X-ray abdomen and chest: Plain X-ray of abdomen (erect and supine films) is useful simple investigation. It may show presence of multiple air- fluid levels and dilated loops of gut in case there is subacute or acute intestinal obstruction. Calcification in the abdominal lymph nodes also indicate tuberculosis.

Plain X-ray chest done simultaneously may reveal either healed or active pulmonary tuberculosis in 22 to 80% cases. Although finding of tubercular lesion on chest X-ray supports the diagnosis of abdominal tuberculosis but a normal chest X-ray does not rule it out.

Barium Studies :

Barium contrast studies are useful for the diagnosis of intestinal tuberculosis. It has been documented that barium studies are useful in 75% patients with suspected intestinal tuberculosis. Enteroclysis, in which a mixture of barium and methylcellulose is infused by a rate- controlled pump into the small intestine with fluoro- scopic examination followed by a barium enema may be the best protocol for evaluation of intestinal tuberculosis.

Barium meal follow through is the best diagnostic test for intestinal lesions. The bowel lesions highly suggestive of tuberculosis include multiple strictures, distended caecum or terminal ileum. The other radiological findings include mucosal irregularity and rapid emptying (ulcerative variety), flocculation and segmentation of barium column (malabsorption pattern), dilated loops and strictures, displaced loops by enlarged lymph nodes and adhesions between gut loops and adherent fixed loops (adhesive peritoneal disease). Barium meal follow through findings in abdominal tuberculosis are divided into 4 groups. For tuberculosis of colon and ileocaecal region, the barium enema studies are useful. The thickening of ileocaecal valve with triangular appearance, pulled up caecum and/or wide gaping of the valve with narrowing of the terminal ileum (an inverted umbrella sign, or Fleischner's sign, have been described in early ileocaecal tuberculosis. Double contrast barium studies are more useful for mucosal details

and visualizations of ulceration in the early stages of the disease. The tubercular ulcers are shallow with elevated margins and are situated along the circumference of the bowel wall. Rarely, there may be deep ulcers with fistulae. The extreme ulceration of the bowel leads to its irritability and early transition of the barium. Rapid transit and lack of retention of the barium in an inflamed segment of the small bowel constitutes Stierlin's sign". A persistent narrowing or stenosis of the bowel leads to consistent narrowing of stream of barium called the "string sign". Both the Stierlin's and String signs are also seen in inflammatory bowel disease (Crohn's disease), hence, are nonspecific for tuberculosis. Double contrast barium enema may show a shortened ascending colon, deformed (irregular, shortened, narrowed) caecum, incompetent ileocaecal valve with obtuse ileocaecal angle and dilated ileum.

FIG 1. Barium meal follow through showing stricture of terminal ileum and deformed ileocecal junction with pulled up cecum (an inverted umbrella sign)

Classification of Barium Meal Follow through study in Intestinal Tuberculosis :

GROUP 1 :Highly suggestive of intestinal tuberculosis if one or more of the following features are present.

- Deformed ileocaecal valve with dilated ileum
- Contracted caecum with abnormal ileocaecal valve or terminal ileum
- Stricture of ascending colon with shortening or involvement of ileocaecum

GROUP 2 : Suggestive of intestinal tuberculosis if one of the following is present:

- Contracted caecum
- Ulceration or narrowing of terminal ileum
- Stricture of ascending colon
- Multiple sites of narrowing and dilatation leading to formation of small bowel loops

GROUP 3 : Non-specific changes : Features of adhesions, dilatation and mucosal thickening of small bowel loops

GROUP 4 : Normal study

Ultrasound :

The barium studies are sensitive and most useful for diagnosis of intestinal tuberculosis while ultrasono-graphy (USG) is beneficial in extraintestinal (peritoneal, lymph nodes) tuberculosis. The USG of abdomen may show a mass of matted loops of small bowel with thickened walls, rolled up or diseased omentum, and loculated ascites. Fine septae (complete or incomplete), echogenic debris (seen as fine strands and particulate matter) may be seen within tubercular ascites. These septae are due to high fibrin content of the exudative ascitic fluid. However, these findings are not specific to tuberculosis as they may be observed in malignant ascites. Peritoneal thickening and nodularity are the other ultrasonographic findings of peritoneal tuberculosis. Interloop ascites due to localized collection of fluid between radially-oriented bowel loops named as Club sandwich or Sliced bread sign may be observed. The other conditions that may produce similar findings include mesothelioma, peritoneal carcinomatosis, and sometimes septic peritonitis and hemoperitoneum. Omental cakes and adhesions commonly seen in peritoneal mesothelioma may be observed in peritoneal tuberculosis. Peritoneal tubercles are usually small and rarely seen on USG.

Tubercular lymphadenitis usually involves mesenteric, peri-pancreatic, periportal and para-aortic groups of lymph nodes. These lymph nodes are seen as conglomerate mass and/or as scattered enlarged nodes with hypoechoic center

because of necrosis. This necrosis within lymph nodes may also be seen in metastatic lymphadenopathy. However, caseation with calcification is highly suggestive of tubercular lymphadenitis rather than malignant. The nodes may transiently increase in size once the treatment is started and then gradually diminish in size.

Small bowel mesenteric thickening (15 mm or more) with increased echogenicity combined with mesenteric lymphadenitis is a characteristic ultrasonographic feature of early abdominal (mesenteric) tuberculosis. Omental thickening with altered echogenicity has also been reported. Ultrasonography is also helpful in detecting intestinal tuberculosis. The findings reported include dilated small bowel loops, bowel wall thickening showing a hypoechoic halo measuring >5 mm.

Lastly ultrasound is also helpful for guiding procedures like ascitic fluid aspiration or fine needle aspiration cytology or biopsy from the enlarged lymph nodes or hypertrophic lesions.

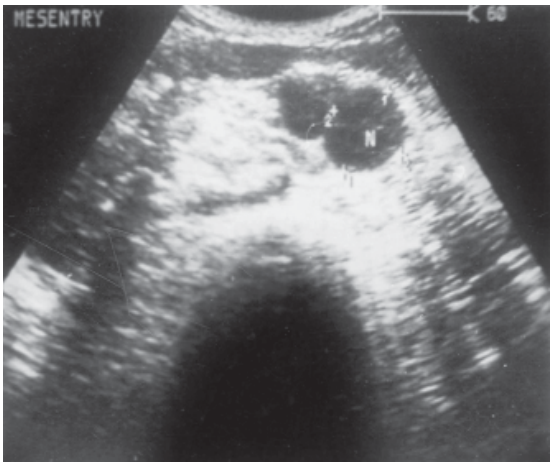


FIG 2. Abdominal ultrasonography showing enlarged mesenteric lymph nodes (Note the hypoechoic centers due to caseation)

Computed Tomography (CT) :

Abdominal CT scan is better than ultrasound for detecting high density ascites, lymphadenopathy with caseation, bowel wall thickening and irregular soft tissue densities in the omental area. Abdominal lymphadenopathy is the commonest manifestation of tuberculosis on CT. Contrast enhanced CT (CECT) is better than plain CT, shows four patterns of contrast enhancement, i.e. (i) peripheral enhancement, (ii) non homogenous enhancement, (iii) homogenous enhance- ment and (iv) homogenous non-enhancement. Though not pathognomic, the pattern of peripheral rim enhancement could be highly suggestive of tuberculosis (Fig. 5). A similar pattern is seen in metastatic lymphadenopathy. The presence of calcification in the lymph nodes in the absence of a known primary tumor suggests tubercular lymphadenitis. Tuberculosis involves predominantly the omental, mesenteric and upper para-aortic lymph nodes; while lower para-aortic lymph nodes are commonly involved in Hodgkin's and Non-Hodgkin's lymphoma.

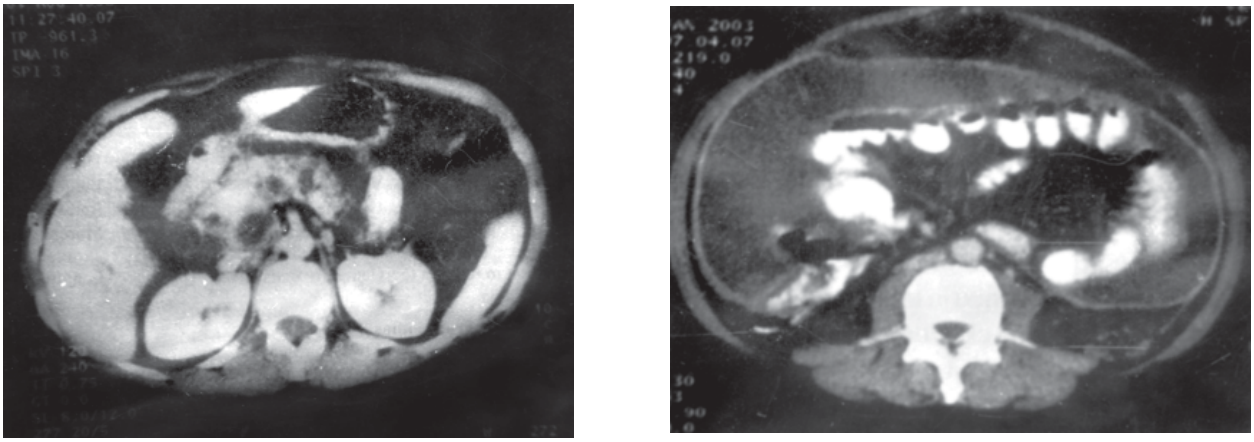


FIG 3. Abdominal CT scan showing caseous lymph nodes in tubercular lymphadenitis and tubercular peritonitis

High density ascites due to high protein and cellular contents of fluid though common in tuberculosis, but can also be seen on CT in mesothelioma and peritoneal carcinomatosis. The CT scan can differentiate between the two, i.e. smooth peritoneum with minimal thicken- ing and marked enhancement on CECT suggest tuberculosis while nodular and irregular thicken- ing of peritoneum suggest peritoneal malignancy.

Loculated fluid collections in the presence of omental infiltration, peritoneal enhancement, transperitoneal reaction, i.e. septal, and mesenteric (macronodules >5 mm in diameter) or bowel involvement are important features of abdominal tuberculosis on CT.

The most common CT finding of bowel wall[13] involvement is a mural thickening affecting the ileo- caecal region either limited to terminal ileum, caecum or both the regions. The other CT findings reported to be highly suggestive of abdominal tuberculosis are irregular soft tissue densities in omental area, low density masses and a disorganized appearance of soft tissue densities, fluid and bowel forming an ill-defined mass.

Tuberculosis of the liver and spleen may appear as tiny low density foci on CT widely distributed through- out the organ. There is a hepatosplenomegaly with areas of calcification within them. The macronodular form of hepatosplenic

tuberculosis may be seen as multiple low attenuation, 1-3 cm round lesions or simple tumor like masses. These lesions may show peripheral enhance- ment on CECT.

The tuberculosis of the pancreas may produce multiple well defined hypoechoic areas on USG and as hypodense necrotic regions on CT.

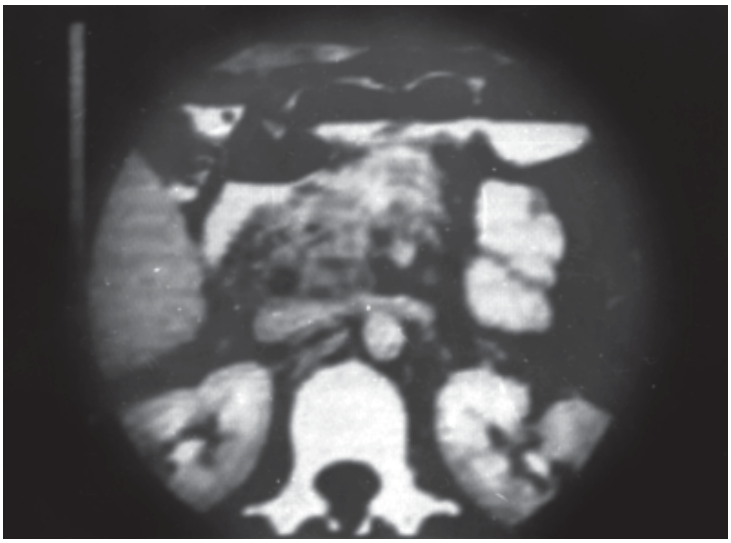


Fig 4. Pancreatic tuberculosis. CT scan shows multiple nodules in the pancreatic area. In addition, there is enlargement of peripancreatic lymph nodes also

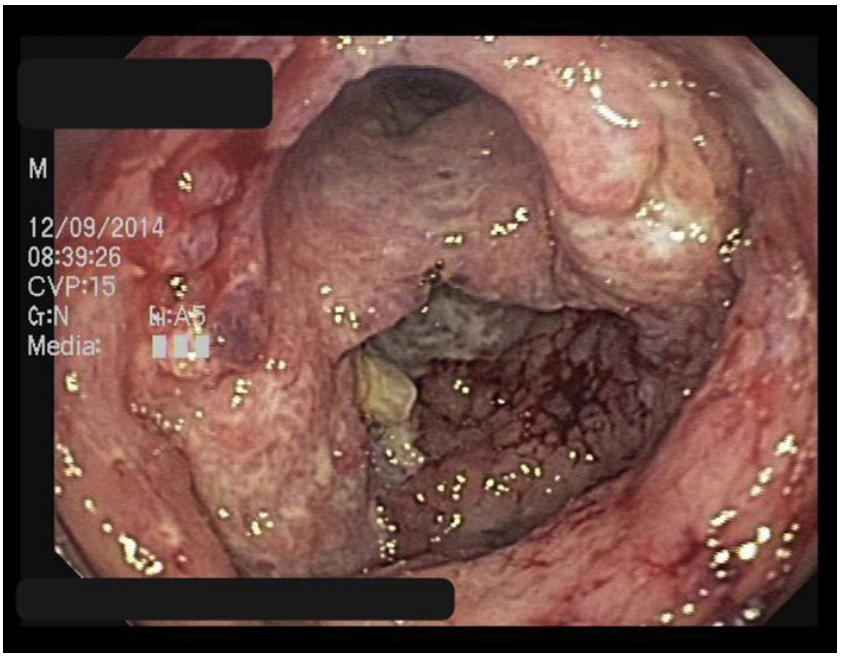


Fig 5. Colonic tuberculosis. Note the multiple colonic ulcers and nodules on colonoscopic view

MRI (Magnetic Resonance Imaging)[17]

MRI when compared to CT has no added advantage in the diagnosis of abdominal tuberculosis, hence, its utility in abdominal tuberculosis is limited.

Colonoscopy

Colonoscopy is an excellent tool to diagnose colonic and terminal ileal involment but is still often underutilised. Mucosal nodules of variable sizes (2 to 6 mm) and ulcers in a discrete segment of colon, 4 to 8 cm in length are pathognomic. The nodules have a pink surface with no friability and are most often found in the caecum especially near the ileocaecal valve. Large (10 to 20 mm) or small (3 to 5 mm) ulcers are commonly located between the nodules. The intervening mucosa may be hyperemic or normal. Areas of strictures with nodular and ulcerated mucosa may be seen. Other findings are pseudopolypoid edematous folds, and a deformed and edematous ileocaecal valve. Diffuse involvement of the entire colon is rare (4%), but endoscopically can look very similar to ulcerative colitis. Lesions mimicking carcinoma have also been described.

Most workers take up to 8-10 colonoscopic biopsies for histopathology and culture. Biopsies should be taken from the edge of the ulcers. However, there is a low yield on histopathology because of predominant submucosal involvement. Granulomas have been reported in 8-48 per cent of patients and caseation in a third

(33-38%) of positive cases. The yield of acid fast bacilli stains has been variable in studies. Culture positivity is not related to the presence of granulomas. Bhargava et al reported positive cultures in 40 per cent of patients and concluded that routine culture of biopsy tissue increases the diagnostic yield. A combination of histology and culture of the biopsy material can be expected to establish the diagnosis in over 60 per cent of cases.

Laparoscopy

Laparoscopy examination is an effective method of diagnosing tubercular peritonitis because (i) it directly visualizes the inflamed thickened peritoneum studded with whitish-yellow miliary tubercles and (ii) biopsy of the peritoneum confirms the diagnosis. Laparoscopy facilitates an accurate diagnosis in 80-90% of patients. Laparoscopic biopsy specimens may reveal AFB in 75% patients and caseating granulomas in 85-90% patients. The finding of adhesions or fibrotic strands within turbid ascites is virtually diagnostic of tuberculosis. The liver, spleen and omentum can also be examined on laparoscopy, are also studded with tubercles in hepatosplenic tuberculosis. Laparoscopy through open exposure of the peritoneum may be employed in patients with fibroadhesive peritoneal tuberculosis so as to avoid chances of perforation.

Ascitic Tap (Paracentesis)

The ascitic fluid in tuberculosis is exudative (protein >3 g%) with serum-ascites albumin gradient <1.1 g%. Ascitic fluid WBC count is 150-4000 cell/mm^3 and consists of predominant lymphocytes. Neutrophils may be seen in early stages of the disease. RBCs, sometimes, may also be seen. Ascitic fluid reveals AFB only in <3% of the cases and culture for M. tuberculosis is positive only in 20% of patients.

Adenosine deaminase (ADA) activity in ascitic fluid is a sensitive and specific marker for tuberculosis. ADA is an enzyme present in T-lymphocytes and macrophages, hence, its levels increase due to stimulation of T- lymphocytes in response to CMI to mycobacterial antigens. Dwivedi, et al[21] have shown a sensitivity and specificity of 100 and 97% respectively when the cut off value of 33U/L was taken. Similarly ascitic fluid to serum ADA ratio >0.985 was also found to be suggestive of tuberculosis. Falsely low levels of ADA can be found in immunocompromised individuals.

Interferon-γ (INF-γ) is an important immune- regulator, is produced by T-lymphocytes in response to stimulation with specific antigens and is capable of activating the macrophages, increasing their bactericidal activity against M. tuberculosis. High levels of INF-γ have been found in ascites due to tuberculosis

than non- tubercular. The diagnostic accuracy of this test is yet to be established but combining both ADA and INF-γ estimation in ascitic fluid increase the sensitivity and specificity of the diagnosis of tubercular ascites.

Serodiagnosis :

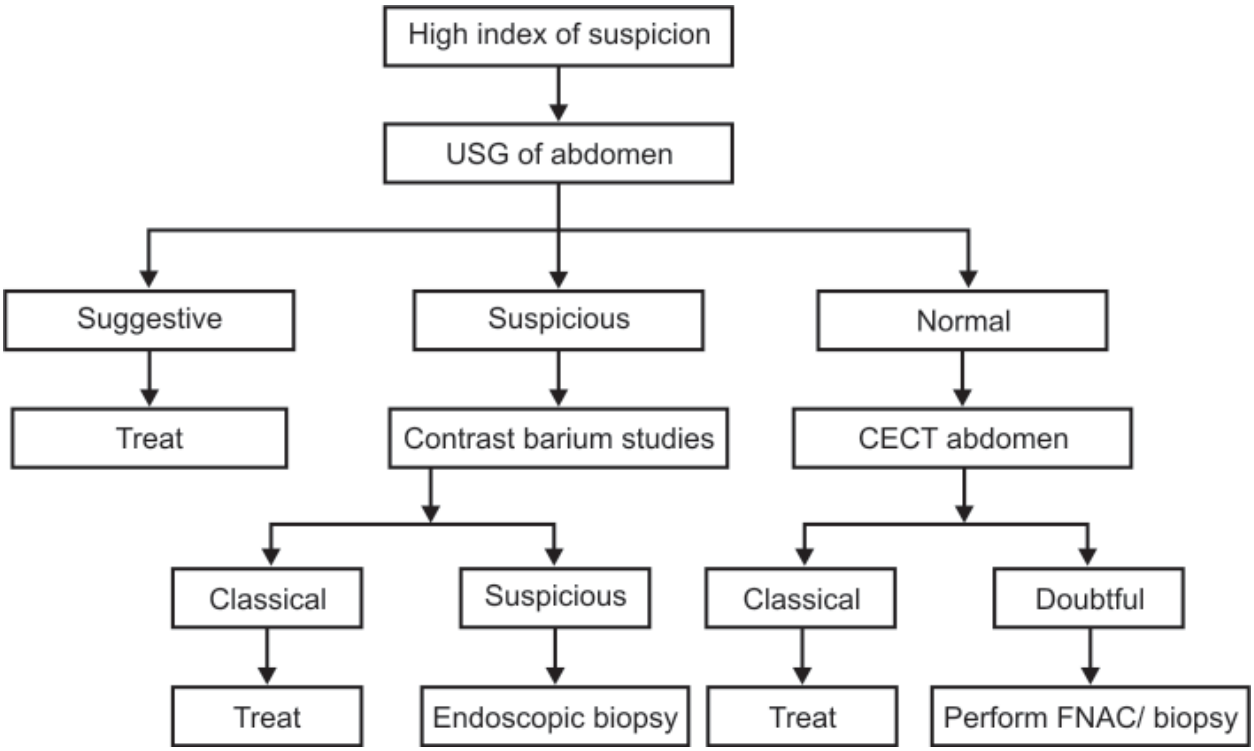
Conventional histological and microbiological methods are often inadequate for the diagnosis of abdominal tuberculosis as it is a paucibacillary disease. A number of serological tests based on the detection of antibody to a variety of mycobacterial antigens developed but all of them have a low predictive value. Polymerase chain reaction (PCR) assay for detection of M. tuberculosis in endoscopic biopsy specimens has shown promising results.

Soft Tissue Biopsy and Culture

Invasive diagnostic procedures are indicated with suspected abdominal tuberculosis. In addition to specimens of involved sites (lymph node, intestine, peritoneum, liver biopsy), bone marrow aspiration for culture may be useful and have a good diagnostic yield in disseminated (military) tuberculosis particularly in HIV infected patients.

Diagnostic Algorithm :

Neither clinical signs, laboratory, radiological and endoscopic methods nor bacteriological and histopatho- logical findings provide a gold standard by themselves for the diagnosis of abdominal TB, hence, an algorithmic approach is useful. An algorithmic approach to the radiological diagnosis of abdominal tuberculosis is presented in Flow Chart. Other supportive investiga- tions are done based on the clinical features and imaging



2.6 TREATMENT :

The treatment of abdominal tuberculosis is on the same lines as for pulmonary tuberculosis. Conventional antitubercular therapy for at least 6 months including initial 2 months of HREZ (e.g. isoniazid, rifampicin, ethambutol and pyrazinamide) followed by 4 month HR is recommended in all patients with abdominal tuberculosis. However, previously, the antitubercular therapy was extended upto 8 to 12 months, but recently, a 6 month short course chemotherapy regimen has been found as effective as standard 12 months regimen. However, many physicians still extend the duration of treatment to 12 to 18 months4. Corticosteroids have been employed to decrease fibrosis during healing so as to prevent development of obstruction but now-a-days, not preferred as they may delay healing and predispose to perforation or further obstruction. Studies have now shown that even obstructing intestinal lesions can be successfully treated with antitubercular drugs without the need for surgery and complete resolution of radiological abnormalities may occur. A randomized comparison of a 6 month short course chemotherapy with a 12 month course of ethambutol and isoniazid (supplemented with streptomycin for the initial 2 wk) was conducted by Balasubramanium et al at Tuberculosis Research Centre, Chennai, in 193 adult patients. Cure rate was 99 and 94 per cent in patients given short-course and the 12

month regimen respectively. However many physicians extend the treatment duration to 12 to 18 months.

The surgical treatment of intestinal tuberculosis has gone through three phases. Bypassing the stenosed segment by enteroenterostomy or by ileotransverse colostomy was practiced when effective antitubercular drugs were unavailable, as any resectional surgery was considered hazardous in the presence of active disease. This practice however, produced blind loop syndrome, and fistulae and recurrent obstruction often occurred in the remaining segments. With the advent of antituberculous drugs, more radical procedures became popular in an attempt to eradicate the disease locally. These included right hemicolectomy with or without extensive removal of the draining lymph nodes and wide bowel resections. These procedures were often not tolerated well by the malnourished patient. Moreover the lesions are often widely spaced and not suitable for resection.

The recommended surgical procedures today are conservative. A period of pre operative drug therapy is controversial. Strictures which reduce the lumen by half or more and which cause proximal hypertrophy or dilation are treated by strictureplasty. This involves a 5-6 cm long incision along the anti-mesenteric side which is closed transversely in two layers. A segment of bowel bearing multiple strictures or a single long tubular stricture may merit resection. Resection is segmental with a 5 cm margin.

Tubercular perforations are usually ileal and are associated with distal strictures. Resection and anastomosis is preferred as simple closure of the lesions is associated with a high incidence of leak and fistula formation.

Two reports suggest that obstructing intestinal lesions may relieve with antitubercular drugs alone without surgery. Anand et al reported clinical and radiological resolution of tuberculous strictures with drug therapy even in patients with subacute intestinal obstruction. They treated 39 patients with obstructive symptoms using medical therapy. At the end of one year 91 per cent showed clinical improvement, 70 per cent had complete radiological resolution and surgery was needed in only 3 cases (8%). Predictors of need for surgery were long strictures (>12 cm) and multiple areas of involvement. Similar observations were made by Balasubramaniam et al. The mean time required for the relief of obstructive symptoms was 6 months.

Treatment of HIV Co-existent Tuberculosis

The key therapeutic principles underlying the treatment of HIV-TB are:

1. The treatment of TB should precede the treatment of HIV infection, i.e. HAART.

2. Patients already on HAART, should continue the same treatment with appropriate modifications in HAART and ATT.

3. Patients who are not receiving HAART, the need and time of initiation of HAART have to be decided on individual basis after assessing the CD4 count and type of TB.

Principles of ATT in the setting of HIV positive TB

are identical to those for HIV-negative cases with two exceptions. In HIV-infected patients with TB, DOTS should be initiated with isoniazid, rifampicin, ethambutol and pyrazinamide (HREZ) for first two months followed by isoniazid and rifampicin (HR) for subsequent 7 months. Since rifampicin resistance is common in HIV patients if CD4 count is <100/mm3, therefore, first exception, is that treatment regimen should be daily or thrice a week instead of twice a week DOTS during the continuation phase. Second exception is that the continuation phase should be extended to 7 months, so as to make it a regimen of 9 month duration for HIV-TB patients.

Adverse reactions to both ATT and antiretroviral therapy are common, need to be carefully monitored. Immune restoration syndrome or immune reconstitution inflammatory syndromes (IRIS) have been reported in 32- 36% of patients with HIV-TB infection, within days to weeks after start of antiretroviral therapy.

2.7 SPECIFIC SUBTYPES

ILEOCAECAL TUBERCULOSIS

Ileocaecal tuberculosis is the most common site of abdominal tuberculosis due to presence of Peyer's patches; and stasis of luminal contents favoured by ileocaecal valve. Mode of infection may be direct or blood spread, usually from lungs. Atypical mycobacteria can spread directly. *Mycobacterium avium* spreads through lymphatics.

Causative organism

Mycobacterium tuberculosis

- Acid fast 20% H2SO4
- Alcohol fast
- Gram neutral

Histology

- Epithelioid cells diagnostic
- Langhan's giant cells
- Features of granuloma

- Caseating necrosis.

Types

Ulcerative : most common 60%. Circumferential transverse often multiple 'girdle' ulcers with skip lesions can occur. It is common in old, malnourished people. Long-standing ulcers cause fibrosis and later stricture formation. Stricture (Napkin ring stricture) is common in ileal part. Often related intestinal nodes are also involved with caseation, abscess (cold) formation. Bowel adhesions are common. Patient mainly presents with diarrhoea, blood in stool, loss of appetite and reduced weight.

Hyperplastic: Fibroblast reaction in submucosa and subserosa causing thickening of bowel wall and lymph node enlargement, leading to nodular mass (tumour-like) formation. It is 10% common, less virulent, with adequate host resistance, seen in young well nourished individuals. It is common in caecal part. It causes extensive chronic inflammation, fibrosis, bowel adhesions, nodal enlargement, often presents with mass in the right iliac fossa. Caseation necrosis is not common. When present as a mass, it can cause subacute intestinal obstruction. It is commonly primary intestinal tuberculosis. There is no primary focus in the lungs.

Ulcerohyperplastic - 30% incidence

Clinical Features

- Abdominal pain is the most common symptom (90%). It is dull in mesenteric type; colicky in intestinal type.
- Common in 25-50 years age group. Equal in both sexes.
- Anaemia, loss of weight and appetite (80%).
- Diarrhoea—10-20%.
- Fever—50-70%.
- Mass in right iliac fossa, (35%) which is hard, nodular, nonmobile, nontender with impaired resonance, which may mimic carcinoma caecum. Subacute obstruction can occur.
- Often ileocaecal TB can cause intestinal obstruction (20%)**.**

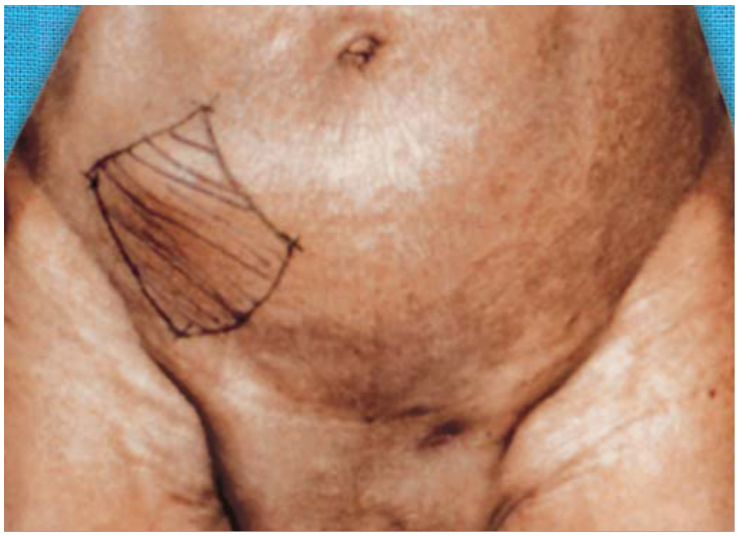


Fig 6. Ileocaecal tuberculosis or tuberculous mesenteric lymphadenitis presenting as mass in the right iliac fossa

Differential diagnosis

- Carcinoma caecum
- Ameboma
- Appendicular mass
- Ectopic kidney
- Retroperitoneal tumour
- Lymph node mass
- Psoas abscess
- Crohn's disease.

Investigations

Non specific

- Chest X-ray to find out primary focus.
- Mantoux test, ELISA (90%), SAFA (soluble antigen fl uorescent antibody - 80%), serum IgG.
- ESR is raised.
- U/S abdomen to see ascites, caecal thickening, nodal status and other organs.

Specific

Plain X-ray abdomen if presentation is of intestinal obstruction. It often shows calcification. It shows calcified lesion in the bowel; in the lymph node; in the liver (calcified granuloma). Perforation when it occurs (rare) shows gas under diaphragm.

Barium study X-ray (Enteroclysis followed by barium enema or barium meal follow through X-ray) (efficacy - 75%).

- Pulled up caecum, conical caecum, pulled down hepatic flexure.
- Obtuse ileocaecal angle
- Hurrying of barium due to rapid flow and lack of barium in inflamed segment (*Steirlin sign*)
- Narrow ileum with thickened ileocaecal valve *(Fleischner sign) (Inverted umbrella sign)*
- Calcifications
- Incompetent ileocaecal valve, ileocaecal spasm
- Ulcers and strictures in the terminal ileum and caecum - *Napkin lesions*

- Earliest signs are - increased transit time; hypersegmentation (chicken intestine); flocculation of barium
- Other signs are - persistent narrow stream (string sign); multiple strictures with enormous dilatation of proximal ileum (mega ileum); straightening of ileocaecal junction with ‘goose neck’ deformity.

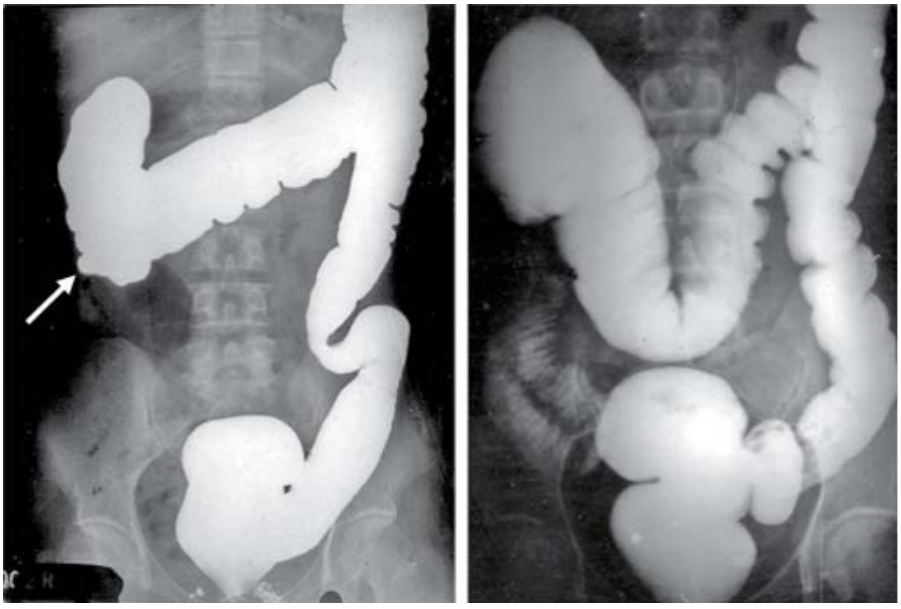


Fig 7. Pulled-up caecum, obtuse ileocaecal angle— ileocaecal tuberculosis in barium study X-ray.

CT scan in abdominal tuberculosis

It is very useful and reliable investigation

It is done with oral contrast - CT enteroclysis

Findings are:

- Thickened bowel wall, thickened peritoneum
- Ileocaecal valve thickening
- Enlarged/necrosed/matted mesenteric nodes often with cold abscess
- Adhesions
- Mesenteric thickening and nodules
- Nodules in the peritoneum/solid organs like liver
- Adhesions in the bowel/stricture/dilatations of the bowel/ features of obstruction
- Loculated ascites
- CT guided FNAC/biopsy/aspiration of fluid can be done

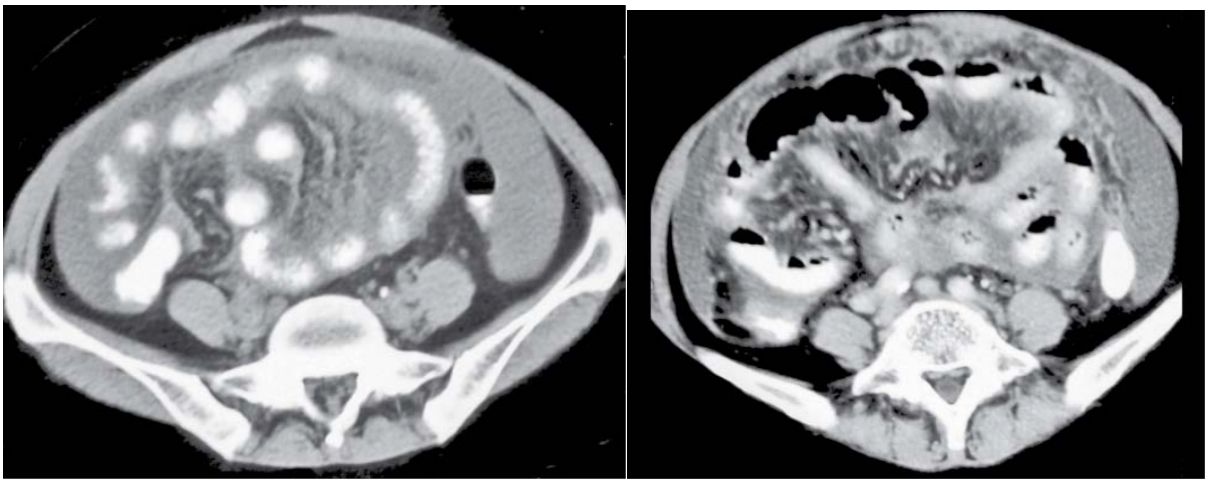


Fig 8. CT scan of abdomen showing features of abdominal tuberculosis.

Colonoscopy is of value to rule out carcinoma. It is easiest and most direct method in establishing the diagnosis. Colonoscopy shows mucosal nodules or ulcers; caecal and ileal strictures; deformed ileocaecal valve; mucosal oedema and

pseudopolyps and occasionally diffuse colitis. Biopsy can be taken to confi rm the diagnosis. Tissue culture or tissue PCR can be done.

Capsule endoscopy is also useful to see small intestinal (tuberculous) pathology in difficult cases.

FNAC of palpable mass.

Laparoscopy is very useful method of investigation. Transabdominal peritoneoscopy is visualisation of the peritoneal cavity using endoscope through a small incision in the abdomen. It aids in visualisation, to collect ascitic fluid for analysis and to take biopsy. Biopsy can be taken from omentum, peritoneum, nodes and suspected areas.

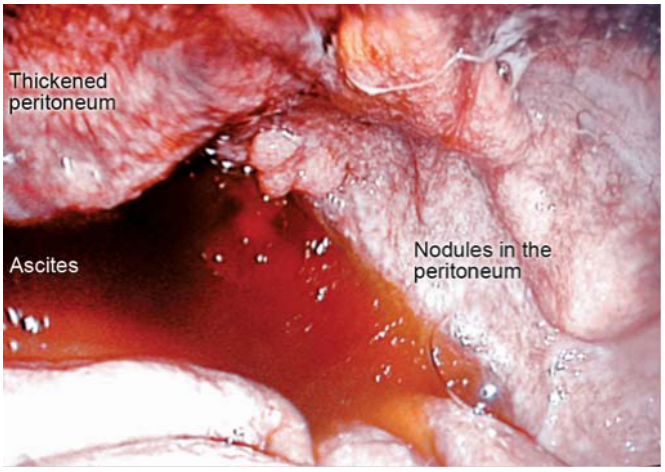


Fig 9. Laparoscopic view of abdominal tuberculosis showing peritoneal nodules and thickening, ascitic fluid, bowel surface tubercles.

Complications of ileocaecal tuberculosis

- Obstruction—20%
- Malabsorption, blind loop syndrome
- Dissemination of tuberculosis to other areas of abdomen as well as extra-abdominal sites
- Faecal fistula
- Cold abscess formation
- Haemorrhage, perforation (rare)

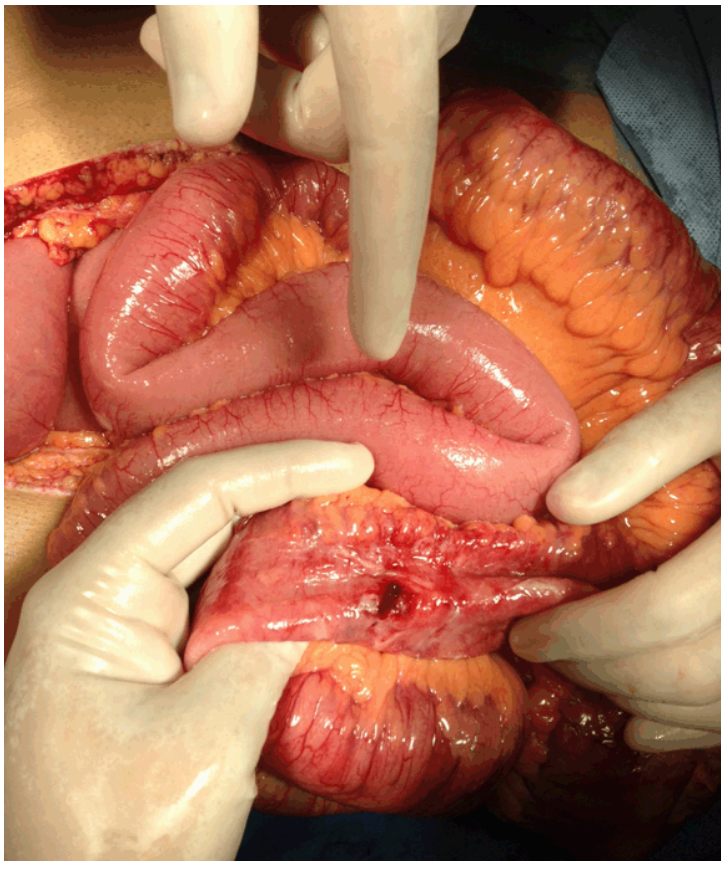


Fig 10. Ileal TB with perforation

Treatment

Medical management

INH; rifampicin; pyrazinamide; ethambutol - first line drugs. In drug resistance cases second line drugs are needed. WHO recommends 6-9 months course. Commonly patient presents with complications and late presentations are also common in many. So, more often treatment for one year may be required in these patients. Recurrent abdominal tuberculosis has got high mortality and difficult to manage.

As they are malnourished supportive therapy in the form of TPN, blood transfusion in preoperative as well as postoperative period is required. Often steroid is used to prevent adhesions along with antituberculous drugs.

Surgical management

Indications for surgery

- Intestinal obstruction.
- Severe haemorrhage.
- Acute abdominal presentation like perforation.
- Intra-abdominal abscess formation or fistula formation.

- Uncertain diagnosis.

Surgeries done are:

Limited ileocaecal resection (with 5 cm margin) is the surgical therapy of choice for ileocaecal tuberculosis. This may be done in initial period depending on the obstructive and other presentations. Often during therapeutic period, healing with fibrosis causes stricture and obstruction in 3-6 weeks after drug therapy. Patient during this time needs limited ileocaecal resection.

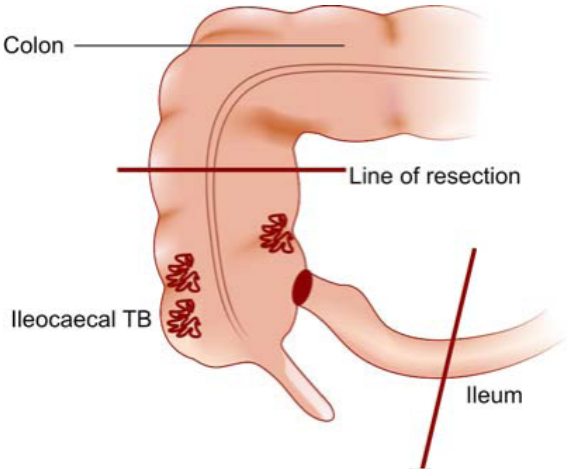


Fig 11. Ileocaceal TB resection margins

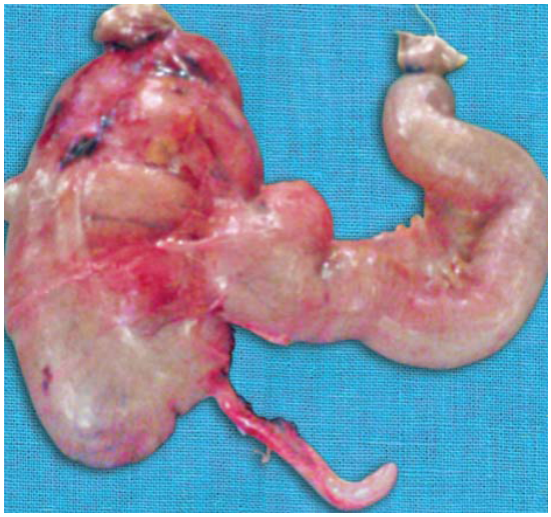


Fig 12. Ileocaceal TB resected specimen

Stricturoplasty may be done in single ileal stricture. But if bowel wall is oedematous and friable then resection would be the ideal choice.

Resection of ileum and anastomosis is done in multiple strictures (ideal). Multiple strictures with long segment gaps_between each can be treated by multiple stricturoplasty. But_viability of the sutured area should be ensured. Resection is better option for stricture within 10 cm of ileocaecal valve.

Fig 12. Ileocaceal TB with stricture formation

Fig 13. Resected specimen showing transverse ulcer which caused the stricture

In perforation of ileal bowel, resection and anastomosis is done. Biopsy from perforation site and closure can be done in early perforations but chances of leak and fecal fistula formation is high (due to closure of perforation over a diseased bowel) and so resection is better option. In severely contaminated peritoneum, resection and exteriorisation is done. Bowel continuity is maintained after proper antituberculous chemotherapy and proper nutritional improvement.

During therapy, if patient develops ileocaecal obstruction, ileotransverse colon anastomosis (bypass) can be done. But this is not a good procedure as it causes blind loop and tuberculous focus is retained. Now this bypass is used only in patient presenting with acute intestinal obstruction with poor general condition and in high-risk group patients as a life-saving procedure. A definitive second stage right hemicolectomy is needed in these patients at a later period.

Adhesive obstruction may be released through laparoscopic adhesiolysis. It is often technically difficult to release dense adhesions even by open method.

Drainage of intra-abdominal abscess, perianal abscess and treatment for tuberculous fistula-in-ano is done when necessary.

ILEAL TUBERCULOSIS

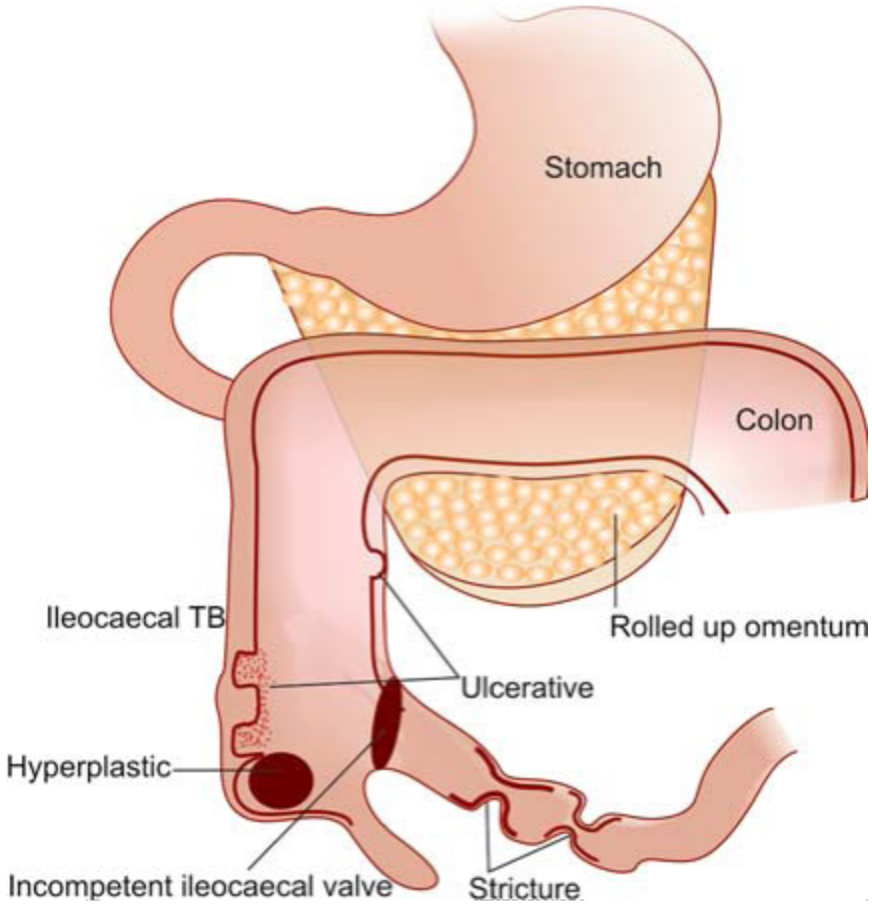


Fig 14. Ileocaecal tuberculosis with rolled up omentum

It is usually *stricture* type.

It may be multiple.

- It presents usually with intestinal obstruction.
- Bowel adhesion, localisation, fibrosis, secondary infections are quiet common

- Perforation (5%) though rare culminates in peritonitis.

Plain X-ray shows multiple air fluid levels. Treatment *is resection and anastomosis and to continue anti-TB drugs*. Often *stricturoplasty* is beneficial.

PERITONEAL TUBERCULOSIS

Pathology in Peritoneal Tuberculosis

- Enormous thickening of the parietal peritoneum with multiple tiny yellowish tubercles.
- Dense adhesions in peritoneum and omentum with content inside as small bowel looking like ***abdominal cocoon***. It may precipitate intestinal obstruction.
- Multiple dense adhesions between bowel loops and between bowel and peritoneum and omentum.
- Thickening of bowel wall with adhesions.

Types

1. Acute Type—Mimics Acute Abdomen

Acute peritoneal tuberculosis is a rare entity usually an on-table diagnosis. It can present with features of peritonitis due to perforation or rupture of mesenteric

tuberculous lymph nodes. Exploratory laparotomy reveals straw-coloured fluid with tubercles in the peritoneum, greater omentum and bowel wall. Fluid is evacuated and collected for AFB study and culture. Omental biopsy is taken. Abdomen is closed (without a drain) with tension sutures to prevent burst abdomen. ATD is started.

2. Chronic Tuberculous Peritonitis

Present as abdominal pain, fever, ascites, loss of weight and appetite, abdominal mass, ***doughy abdomen (10%).*** Peritoneum is thickened with multiple tubercles. Omentum is thick, ***fibrosed, rolled up***. Infection is usually from mesenteric lymph nodes, ileocaecal tuberculosis, from fallopian tubes rarely blood born (from lungs). *Laparoscopy is very useful in this type to diagnose.*

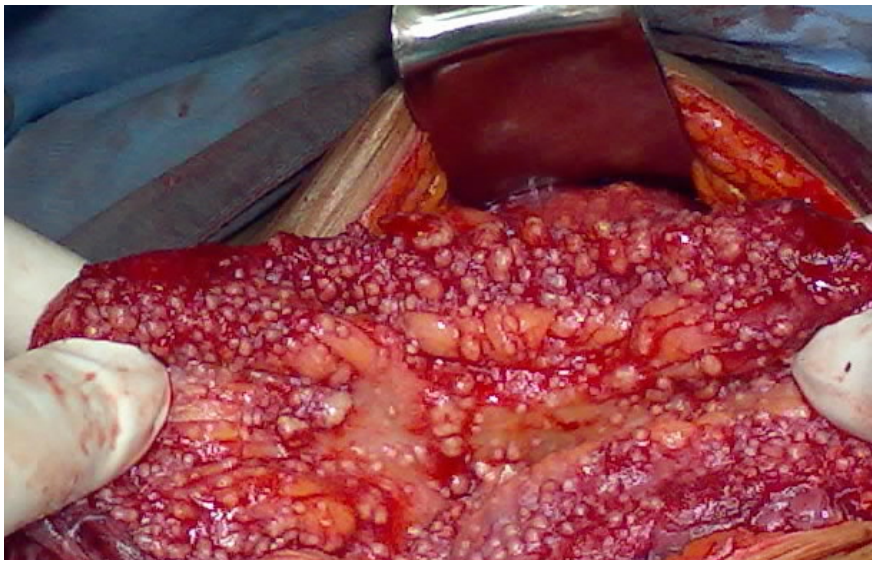


Fig 15. On-table findings in intestinal tuberculosis, of extensive involvement with multiple tiny tubercles

Ascitic form

- **Ascitic form** shows enormous distension of abdomen with dilated veins.
- It presents with congenital hydrocele in male with patent processus vaginalis, umbilical hernia, rolled up omentum, shifting dullness, fluid thrill, and mass abdomen.
- ***Ascitic tap*** reveals straw coloured fluid from which AFB can be isolated. Fluid is pale yellow, clear, rich in lymphocytes, with high specific gravity.
- Chest X-ray, Mantoux test are other required investigations.
- ATDs for one year is required. Repeat tapping may be required initially as part of the treatment.

Fig 16. US picture showing ascites.

Encysted (Loculated) ascites

- Ascites gets loculated because of the fibrinous deposition.
- Dullness, which is not shifting, is the typical feature.
- They may present as intra-abdominal mass, which may mimic ovarian cyst, retroperitoneal cyst or mesenteric cyst.
- Treatment is U/S guided aspiration along with ATD‘s.

Fig 17. Laparoscopic picture of loculated ascites due to abdominal tuberculosis. Fluid is getting aspirated using a needle under laparoscopic vision.

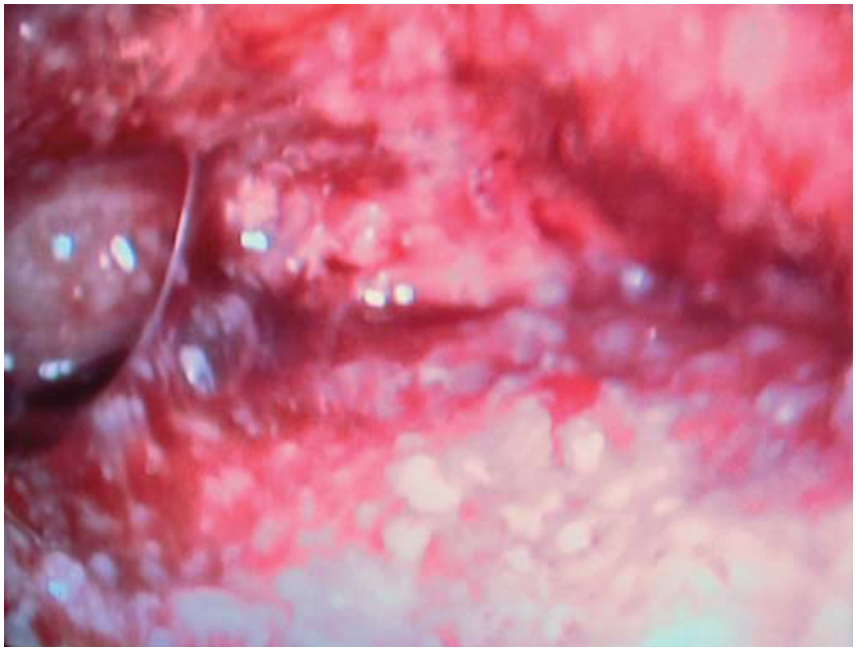
Plastic type

- Here there are wide spread adhesions between the coils of the intestine (ileum commonly), abdominal wall, omentum, with distension of the small bowel, leading to blind loop, ileus, intestinal obstruction (subacute, acute), thickened parietal peritoneum.

- They get recurrent colicky abdominal pain, diarrhoea, wasting, and loss of weight, mass abdomen, and *doughy abdomen*.
- *Differential diagnosis*: Peritoneal carcinomatosis.
- Open/ laparoscopic peritoneal biopsy is very useful tool to diagnose.
- They respond well for drug treatment. Surgery is indicated if obstruction occurs.

Purulent form

- It is invariably due to tuberculous salpingitis, presenting as a mass in the lower abdomen containing pus, omentum, fallopian tubes, small and large bowel.
- Cold abscess gets adherent to the abdominal wall, umbilicus and may form an umbilical fistula.
- Patient commonly has got genitourinary tuberculosis.
- U/S, discharge study, X-ray abdomen and other investigations are useful.
- *Treatment:* ATD's are started exploration of umbilicus, exploration of fistula and bowel by pass is done.
- Prognosis is poor in this type.



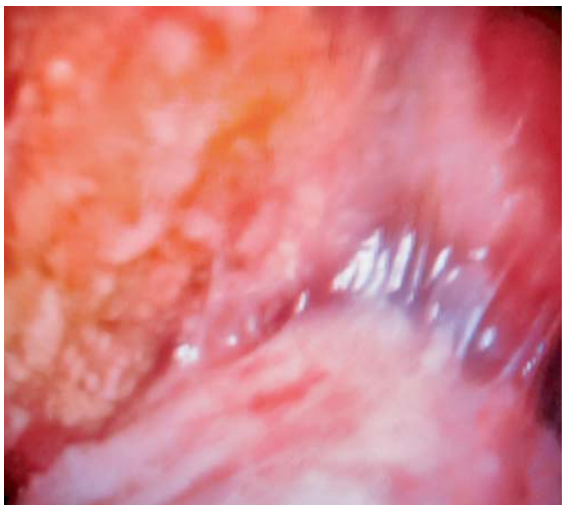


Fig 17 A - C. Laparoscopy showing plastic type of abdominal tuberculosis and multiple tubercles over parietal and visceral surface of the peritoneum with adhesions between bowel and abdominal wall

TUBERCULOUS MESENTERIC LYMPHADENITIS

Infection is usually through the Peyer‘s patches of the intestine (i.e. through oral cavity). Usually several lymph nodes are involved often causing massive lymph node enlargement. Commonly right-sided lymph nodes are involved, but left sided nodes can also get involved. It presents with general symptoms (fever, malaise, weight loss). Pain in umbilical region and right iliac fossa, mass in right iliac fossa, which is matted, nonmobile. It may present with features of *acute appendicitis*. Often coils of intestine get adherent to the caseated mesenteric lymph nodes leading to intestinal obstruction. Most often caseating material may collect between the layers of the mesentery, forming a cold abscess, mimicking a mesenteric cyst (***Pseudomesenteric cyst).*** *Massive enlargement of mesenteric lymph nodes due to tuberculosis is called as* ***tabes mesenterica***. Mesenteric tuberculous adenitis is more common in children. Present with anaemia, fever, loss of appetite and reduced weight, failure to thrive, palpable mass in right iliac fossa which is firm and nodular.

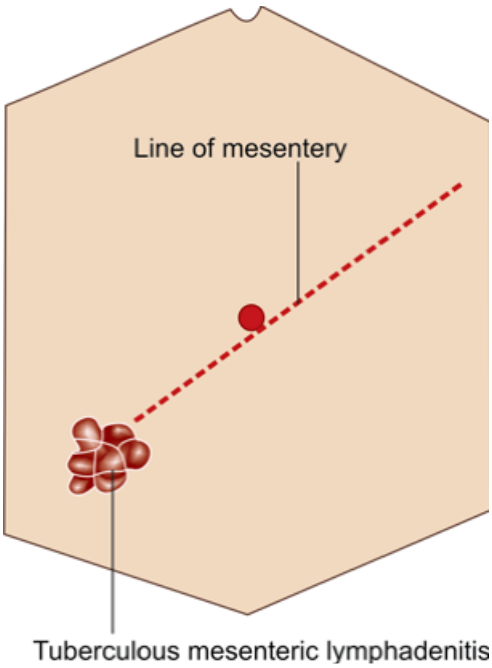
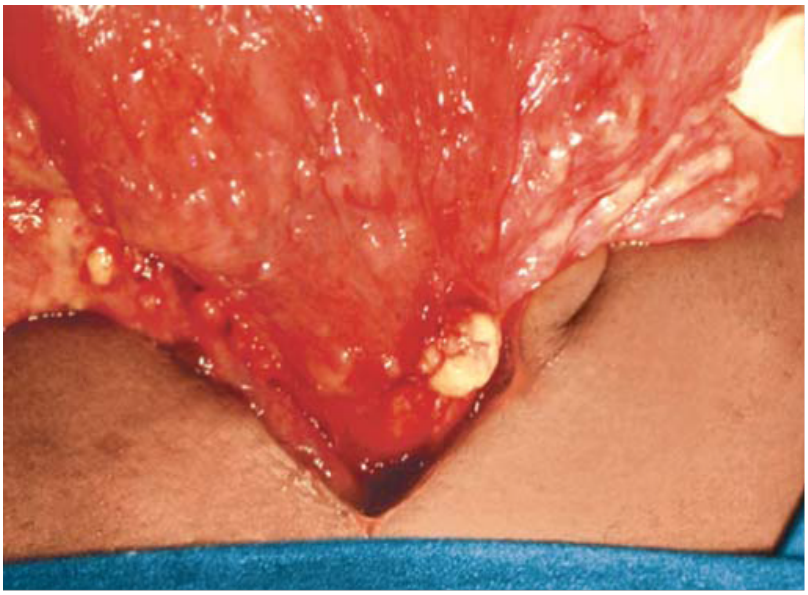


Fig 18. A - C Mesentric Tuberculous Lymphadenitis with on table findings



Differential Diagnosis

- Carcinoma caecum.
- Lymphoma.
- Retroperitoneal tumour.
- Nonspecific lymphadenitis. (Acute nonspecifi c mesenteric lymphadenitis is called as **nurses' syndrome**).

Investigations

- X-ray abdomen shows calcification.
- U/S may confirm the diagnosis.
- Mantoux test may be positive.
- *Diagnostic laparoscopy*—is very useful in TB lymphadenitis.
- Mesenteric cold abscess can be drained safely through laparoscopy.

Treatment: ATD's; Laparoscopy and proceed. Prognosis is good.

ANO-RECTO-SIGMOIDAL TUBERCULOSIS

- It mimics carcinoma rectum.
- It presents as tenesmus, diarrhoea, and discharge from the fistula and occasionally as mass per abdomen. Rectal tuberculosis occurs usually within 10 cm of anal verge.
- Fistulas are *painful and characteristically not indurated*.
- Tuberculous fistulas are commonly multiple.
- Tuberculous anal ulcers when occur are shallow, bluish, with undermined edges.
- Sigmoidoscopy, U/S, discharge study, fistulectomy and biopsy confi rms the diagnosis.
- Treatment is ATD‘s, fistulectomy, often *sigmoid resection*

TUBERCULOSIS OF THE OMENTUM

- It usually occurs as a part of the other types of abdominal tuberculosis.
- Rolled up omentum with thickening is characteristic.
- Often cold abscess can develop per se in the omentum.
- If it is so it can be dealt with laparoscopy safely under the cover of ATDs.

2.8 VARIOUS STUDIES CONDUCTED ON ABDOMINAL TUBERCULOSIS

1. Mukhopadhyaya (1956) emphasized that resection is the ideal procedure from the point of view of disease and its complications and also as a socio-economic expedient to cut down the duration of medical treatment.

2. The patients were subjected to operative treatment under the following criteria: (1) Perforation, (2) Intestinal obstruction, (3) Obscure diagnosis, (4) Localised mass, (5) Enlarged abdominal glands or mass associated with general weakness and low grade fever.

3. The surgical treatment of intestinal tuberculosis has gone through three phases. Bypassing the stenosed segment by enteroenterostomy or by ileotransverse colostomy was practiced when effective antitubercular drugs were unavailable, as any resectional surgery was considered hazardous in the presence of active disease. With the advent of antituberculous drugs, more radical procedures became popular in an attempt to eradicate the disease locally. These included right hemicolectomy with or without extensive removal of the draining lymph nodes and wide bowel resections.

4. Tubercular perforations are usually ileal and are associated with distal strictures. Resection and anastomosis is preferred as simple closure of the lesions is associated with a high incidence of leak and fistula formation.

5. Anand and Pathak (1961) and Bhansali and Desai (1968) advocated resection of the intestine wherever possible. But Joshi (1978) stated tuberculosis is essentially a systemic disease which can be cured by chemotherapy. Resection, however extensive, can not eradicate the entire disease from the body. So the aim of surgery in cases of intestinal tuberculosis is to overcome the deleterious effects of the disease. Conservative surgery is easier to perform, involves less mobilisation of colon, avoids injury to kidney, duodenum and ureter and leaves a considerable length of functioning bowel.

6. Acute abdomen secondary to intestinal tuberculosis usually occurs in a patient who is already malnourished, anaemic and hypoproteinaemic. Often there is fluid and electrolyte imbalance and toxaemia due to perforative peritonitis. In such patients, with multiple stenosis of small bowel, multiple resections are rather dangerous (Parikh, 1978). At the same time, multiple by-pass procedures have many disadvantages and should be avoided at any

cost (Anand and Pathak, 1961). Under these circumstances it is safe to do stricturoplasty. Though the ileo-transverse colostomy has been condemned by many, it is suitable in critical patients with ileo-caecal obstruction.

7. In those patients with peritoneal tuberculosis, subjected to operation, the findings were multiple diffuse involvements of the visceral and parietal peritoneum, white "miliary nodules" or plaques, enlarged lymph nodes, ascites, "violin string" fibrinous strands, and omental thickening. Biopsy specimens showed granulomas, while ascitic fluid showed numerous lymphocytes.

8. Computed tomography was the most frequent imaging modality ; findings suggestive of abdominal tuberculosis were mesenteric/omental stranding (50%), ascites (37%), and retroperitoneal lymphadenopathy (31%). Seventeen of the 18 patients required operative intervention, and one patient underwent CT-guided drainage of a psoas abscess. Laparotomy was performed for complications of abdominal tuberculosis in six patients and to obtain a tissue diagnosis in three patients. Abdominal tuberculosis continues to represent a diagnostic challenge to clinicians.

Chapter 3

MATERIALS AND METHODS

MATERIALS AND METHODS

3.1 Type of study : Prospective and Retrospective Observational Study

3.2 Study approval : Prior to commencement of this study - Thesis & Ethical Committee of Madras Medical College and Rajiv Gandhi Government General Hospital, chennai had approved the thesis protocol.

3.3 Place of study : Rajiv Gandhi Government General Hospital

3.4 Period of study : Duration starting from 01 Sep 2014 to 30 June 2015

3.5 Sample size : 60 cases

3.6 Selection of patients:

a) **Sampling method-** Purposive**.**

b) **Inclusion criteria-** Patients taken up for emergency laparotomy and diagnosed as abdominal tuberculosis either preoperatively or post operatively.

c) **Exclusion criteria - -**

a) Age < 18 & > 60 yrs

b) Emergency laparotomy patients with no evidence of tuberculosis.

c) Patients with abdominal TB who are conservatively managed.

3.7 Study procedure:

Method of sampling was non-random, purposive. After admission short history was taken and physical examination was conducted on each patient admitted in surgery department with features suggestive of acute abdomen requiring emergency laparotomy. Baseline investigations, as routinely required, were done, followed by imaging studies. Those patients whose imaging, intraoperative findings or histopathology was suspicious of tuberculosis were included in the study. All the necessary information regarding the study was explained to the patients or their valid guardian. Informed written consent was taken from the patients or their guardian willing to participate in the study. Detailed history was taken from the study group to establish proper diagnosis. Thorough physical examination was done in each case. Data collection sheets were filled in by the investigator himself. All of the preoperative factors related to the patient were noted down in the data sheet. Strict aseptic precautions were followed during the operation. Meticulous techniques were practiced as far as possible. The operation procedure and related peroperative factors were observed directly and recorded in the data collection sheet instantly. After completing the collection of data it was compiled in a systematic way.

3.8 Variables studied:

i. Age

ii. Sex

iii. Co-morbidities: COPD, jaundice, diabetes, obesity and malnutrition

iv. Chest and Abdomen Xray and LS Spine.

v. Ultrasonogram and CECT findings

vi. Blood parameters

vii. Types of operations

viii. Post operative complications

ix. AFB gram staining

x. Mantoux

xi. Histopathological Examination

3.9 Ethical consideration

All the patients/ legal guardians were given an explanation of the study and about the investigative and operative procedures with their merits and demerits, expected results, and possible complications. If he/she agreed then the case had been selected for this study. The study did not involve any additional investigation or any significant risk. It did not cause economic burden to the patients. The study

was approved by the institutional review board prior to commencement of data collection. Informed consent was taken from each patient/guardian. Data were collected by approved data collection form.

3.10 Data collection

Data were collected by pre-tested structured questionnaire. Data were collected from all the respondents by direct interview after getting informed written consent from them or from their legal guardian.

3.11 Data analysis

Data analysis was done both manually and by using computer. Calculated data were arranged in systemic manner, presented in various table and figures and statistical analysis was made to evaluate the objectives of this study with the help of Statistical Package for Social Science (SPSS).

CHAPTER 4

RESULTS

RESULTS

This descriptive and observational study was carried out to determine the prevalence of abdominal tuberculosis among patients undergoing emergency laparotomies for acute abdomen. Sixty patients fulfilling the inclusion criteria from Surgery department of Madras Medical College and Rajiv Gandhi Government General Hospital during the period of 1 September 2014 to 31 August 2015 were selected. All cases were evaluated clinically. Only essential investigations necessary for diagnosis and preoperative assessment were carried out before operations. All patients underwent surgery as warranted in their case. The patients of both sexes and different ages were included in the study. The results obtained are as follows.

Table 1 : Age and Sex Distribution of patients

Age / Sex	Male	Female	Total
18 - 29	11	3	14 (23.3)
30 - 39	5	10	15 (25)
40 - 49	12	5	17 (28.3)
50 - 59	11	3	14 (23.3)
Total	39 (65)	21 (35)	60 (100)

* Figures in parentheses indicates percentages

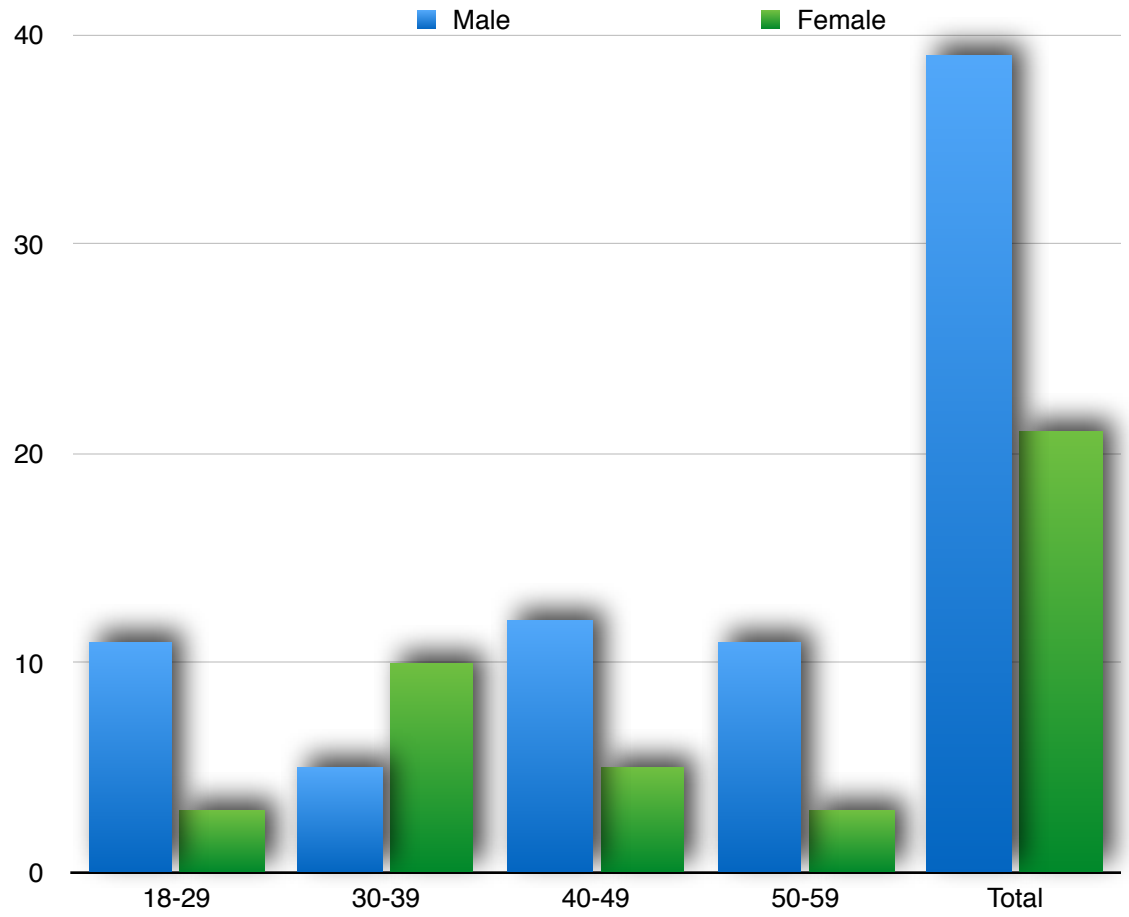


Table 2 : Prevalance of Comorbid Factors in patient group

Co Morbid Factor	Number	Percentage
Diabetes Mellitus	8	13.3
Hypertension	3	5
DM & HTN	1	1.67
HIV	6	10
CAD	1	1.67
No Comorbidity	41	68.33
Total	60	100

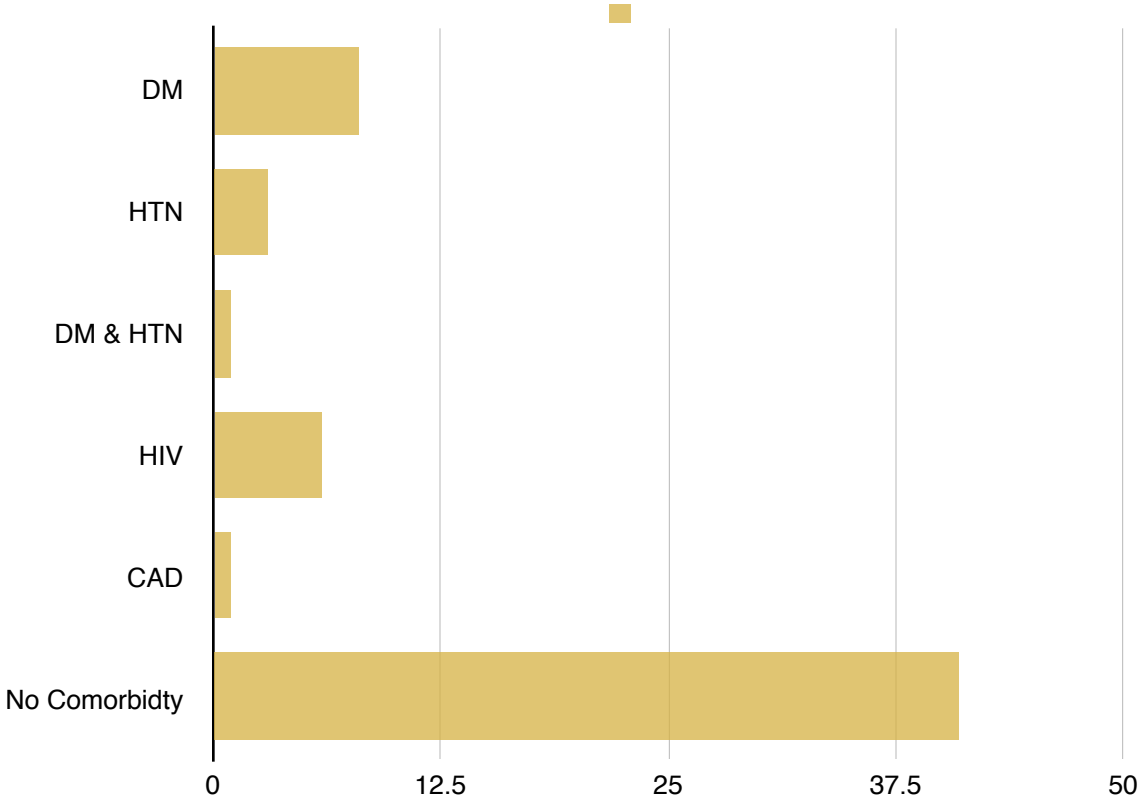


Table 3 : Evidence of tuberculosis in patient group

	Numbers	Percentage
Previous ATT	9	15
Mantoux +ve	42	70
Chest Xray +ve	16	26.67
Sputum AFB +ve	26	43.33
Total	**42***	**70***
No evidence	18	30
Total	**60**	**100**

* - - Patients had overlapping evidence. All forty two were positive for Mantoux, some had Xray findings, some were sputum positive and some had both

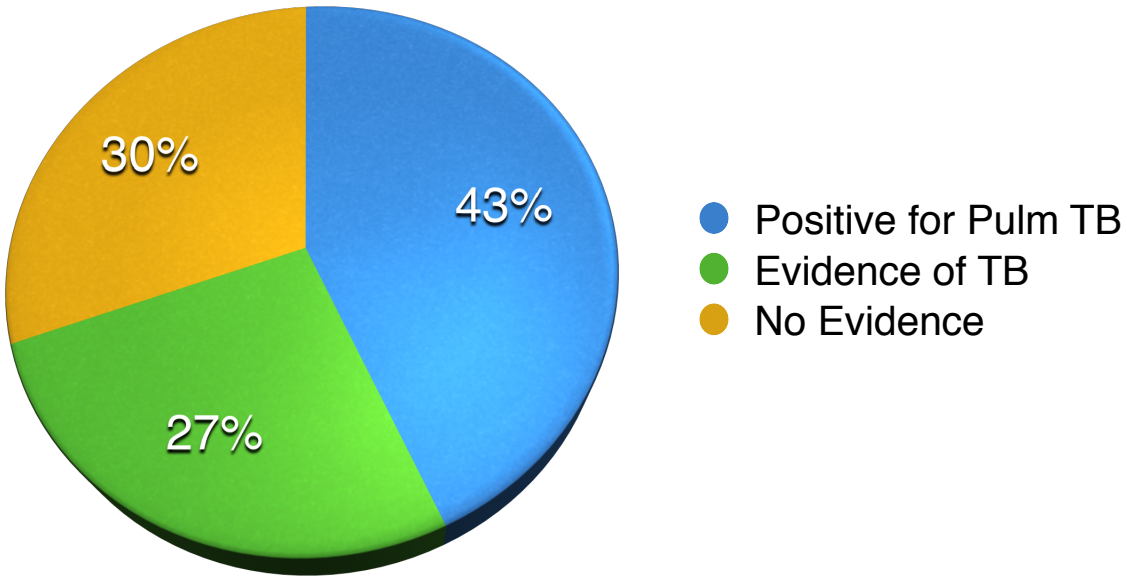


Table 4 : Analysis of Vital Parameters in patient group

Parameters	Within Range		Outside Range	
	Number	Percentage	Number	Percentage
SBP	37	61.67	23	38.33
PR	12	20	48	80
Hb	51	85	9	15
TC	41	68.33	19	31.67
Urea	28	46.67	32	53.33
Na +	57	95	3	5
K +	51	85	9	15

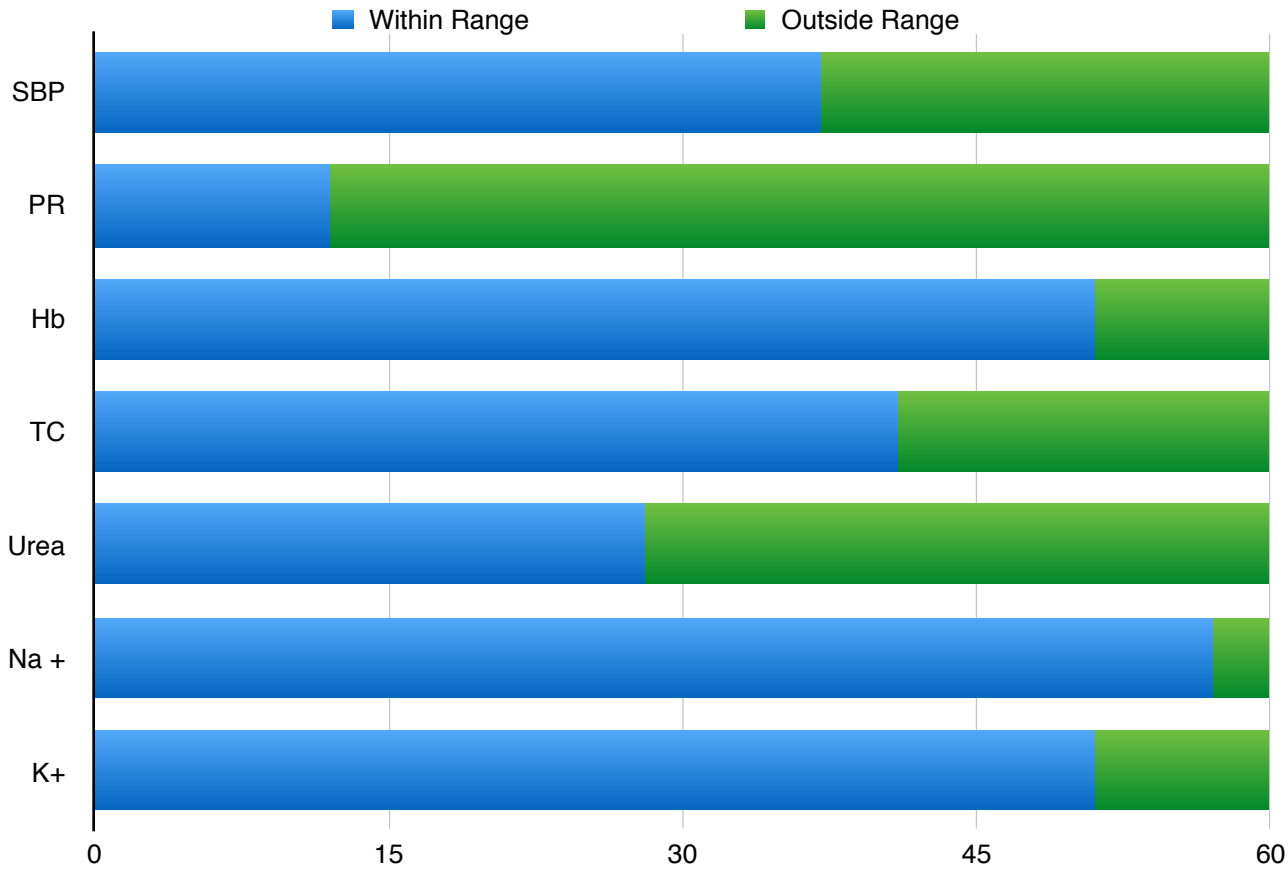


Table 5 : Intra Operative Findings in the patient group

	Numbers	Percentage
Obsrtuction	23	38.33
Perforation	37	61.67
Mesentric Involvement	27	45
Ascites	43	71.67

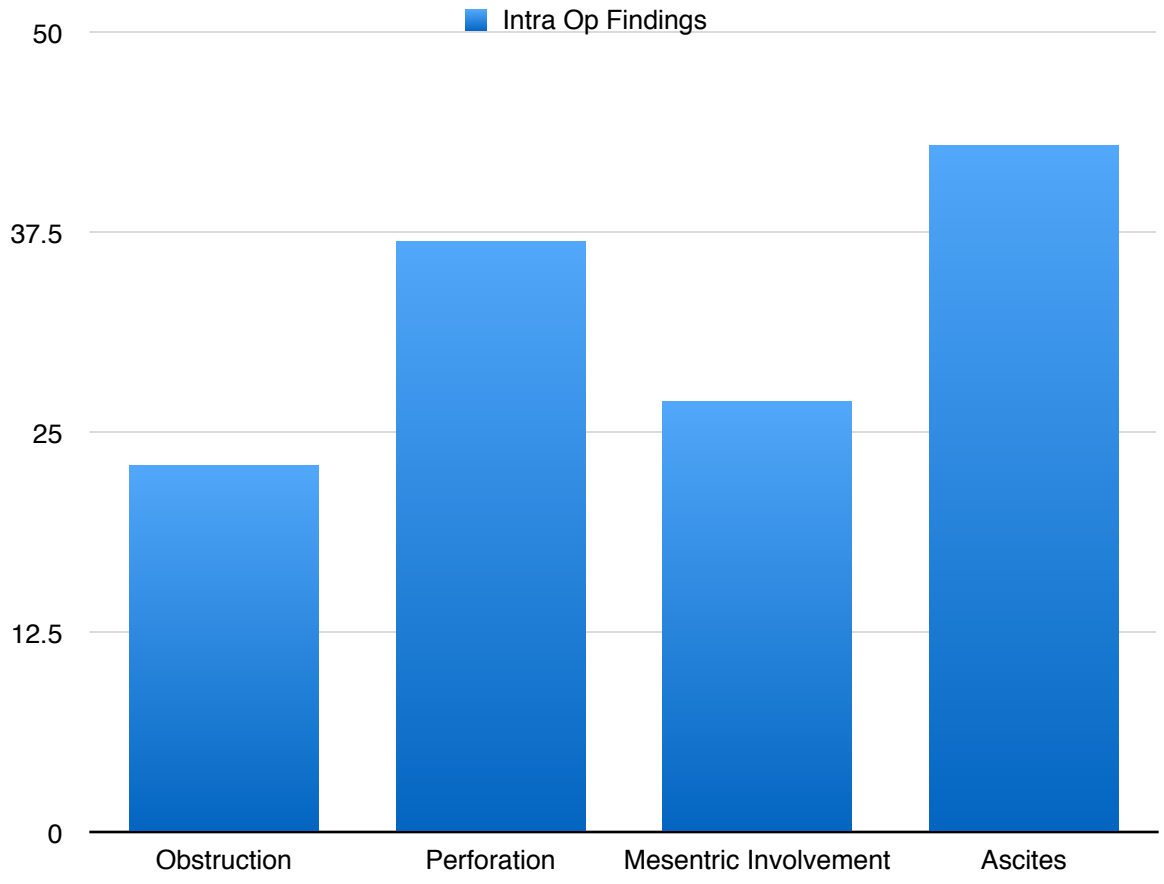


Table 6 : Distribution of Procedure underwent by patients in the Study

	Numbers	Percentage
Stricturoplasty	3	5
Primary Closure	14	23.33
Resection & Anastomosis with Covering Loop Ileostomy	10	16.67
End Ileostomy	10	16.67
Double Barrell Ileostomy	23	38.33

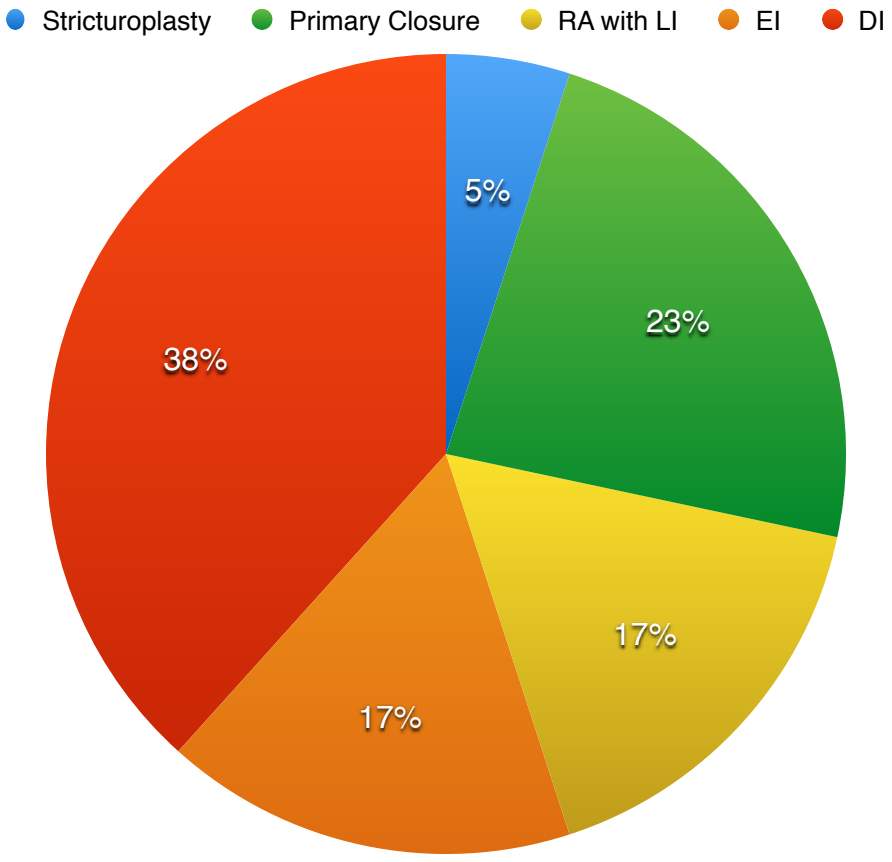


Table 7 : Histopathological findings of post operative specimens

	Numbers	Percentage
AFB +ve	10	16.67
Caseating Adenitis	21	30
Epitheloid Granulomas	21	30
No Specific Abnormality	8	13.33

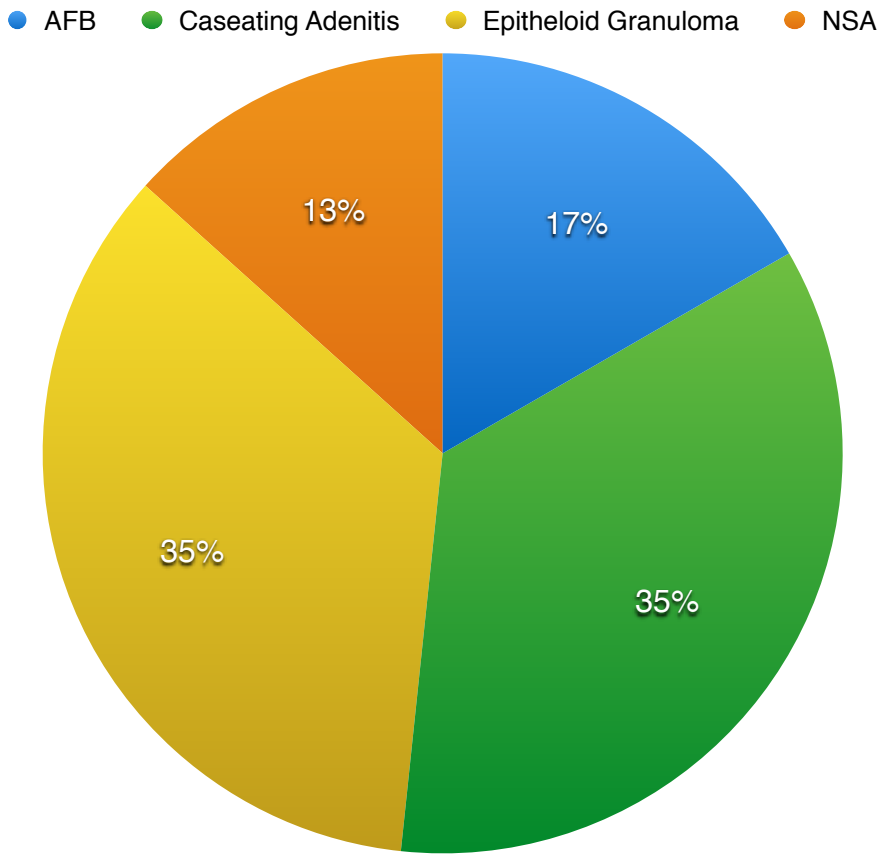


Table 8 : Prevalence of Morbidity among the patient group

	Numbers	Percentage
Acute Kidney Injury	2	3.33
Anastomotic Leak	2	3.33
Basal Atelectasis	5	8.33
Pulmonary Embolism	2	3.33
Pneumonia	2	3.33
Wound Dehiscence	7	11.67
Wound Infection	6	10
No Morbidity	34	56.67
Total	**60**	**100**

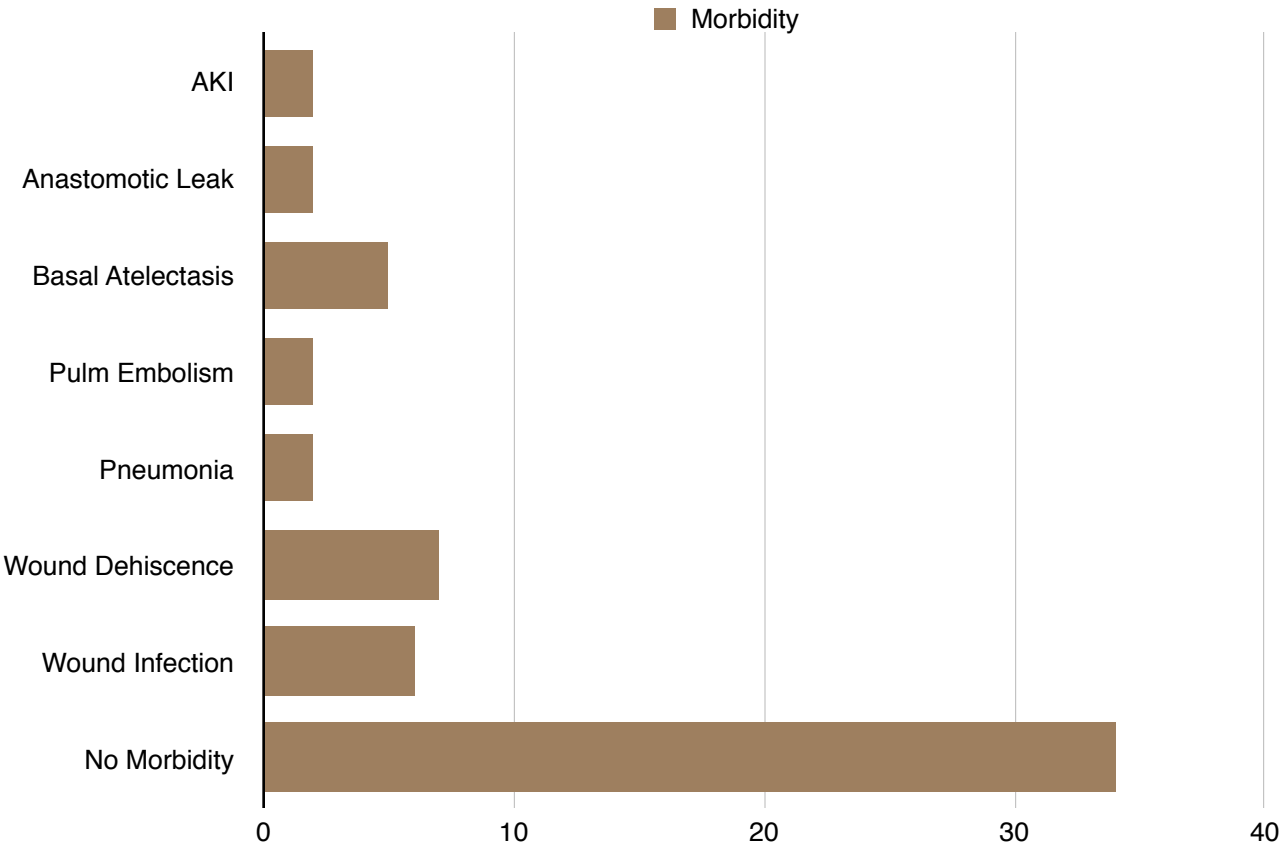
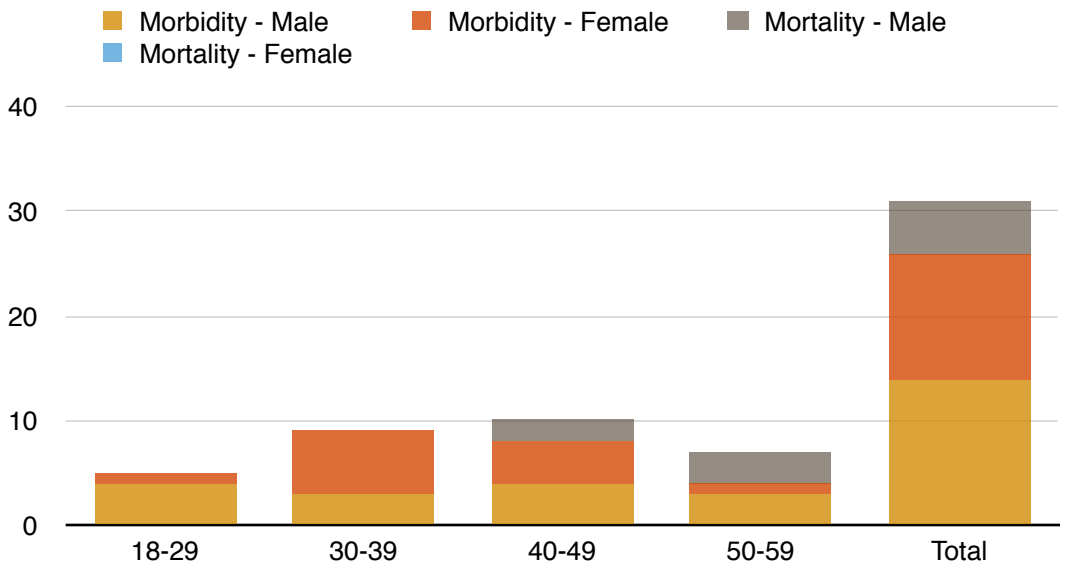


Table 9 : Prevalence of Mortality Among Patient Group

	Numbers	Percentage
MODS	1	1.67
ARDS	2	3.33
Sepsis	2	3.33
Alive	55	91.67
Total	**60**	**100**

Table 10 : Age and Sex distribution of mortality and morbidity

Age / Sex	Morbidity		Mortality	
	Male	Female	Male	Female
18 - 29	4	1	0	0
30 - 39	3	6	0	0
40 - 49	4	4	2	0
50 - 59	3	1	3	0
Total	**14**	**12**	**5**	**0**



CHAPTER 5

DISCUSSION

DISCUSSION OF RESULTS

This descriptive and observational study was carried out to determine the prevalence of abdominal tuberculosis among patients undergoing emergency laparotomies for acute abdomen. Sixty patients fulfilling the inclusion criteria from Surgery department of Madras Medical College and Rajiv Gandhi Government General Hospital during the period of 1 September 2014 to 31 August 2015 were selected. The study was carried out with a view to determine the prevalence of abdominal tuberculosis in those undergoing emergency laparotomy for acute abdomen and to determine the common surgeries done and the prognostic factors.

Age of 60 patients ranged from 18-60 years. The patients were equally distributed among all the age groups. There was no specific age group preponderance. The male to female ratio was ~ 2 : 1. So, it can be assumed that males are the predominantly involved group.

On analysing the comorbid factors, as expected, Diabetes Mellitus was the predominant comorbid factor, seen in 8 patients (13.3%), with systemic hypertension seen in three patients (5%). More significantly, six patients had immunocompromised status which constituted around ten percent of all patients.

On evaluation of patients, nine patients (15%) had history of treatment for tuberculosis in their past. All of them had completed their full course of ATT and was declared cured. Forty two patients (70%) were positive mantoux test. This included the nine patients with positive past history. Sixteen patients (~25%) had stigmata of tuberculosis in their Chest Xray. Twenty six patients (43%) were sputum +ve for tuberculosis. This included the sixteen patients who were positive for Chest Xray. This essentially meant out of the sixty patients in the study only twenty six had Pulmonary Tuberculosis. More significantly, around thirty percent, had no evidence of tuberculosis prior to surgery nor evidence of pulmonary TB in post op evaluation.

An analysis of the vital parameters, when the patient presented to the emergency department, showed that as expected more than 80% of patients had tachycardia while nearly forty patients had systemic hypotension. Elevated total count indicative of peritonitis was seen in nineteen patients (32%) while evidence of pre-renal failure, indicated by elevated urea levels was seen in more than 50% of patients. Around fifteen percent of the patients had electrolyte abnormalities.

Proceeding to intraoperative findings, twenty three patients (38%) had features of intestinal obstruction, due to either strictures or bowel adhesions. All

the patients had distal small bowel involvement. Thirty seven patients (62%) presented with perforation, all of them involving the ileum, mostly the terminal ileum. There was multiple perforation in nine patients. Mesenteric involvement in the form of enlarged mesenteric nodes or tubercles was seen in as much as forty five percent of patients. Ascites was seen in forty three patients (72%), including the thirty seven patients who had perforation.

Regarding the procedures performed, three patients (5%) had stricturoplasty, fourteen patients (23%) had primary closure of their ileal perforations, with ten patients having resection of the obstructed or perforated segment of ileum with anastomosis of the cut ends and a covering ileostomy. Another ten patients had resection with end ileostomy while twenty three patients had resections with proximal ileostomy and distal mucous fistula.

Histopathological examination of either the resected specimen or the mesenteric node biopsy showed features of caveating adenitis or epitheloid granulomas involving the peyer patches in forty two patients (60%). Only ten patients (17%) had demonstrable organisms most of which was obtained in patients with ascites. Eight patients (13%), all of whom had undergone primary closure of isolated perforation had no significant findings in the perforation edge biopsy.

Twenty six patients developed post operative complications, most common being wound site involvement either in the form of wound dehiscence or wound infection. Pulmonary involvement was seen in ten patients which included, pneumonia, basal atelectasis and pulmonary embolism. Anastomotic Leak was seen in only two patients. Two patients had acute renal injury.

The morbidity was equally divided among all age groups and across both genders indicating that the initial presenting severity is more critical than age or sex. Patients who had evidence of concomitant pulmonary tuberculosis had more chances developing post operative complications than those with isolated abdominal tuberculosis.

Five patients died in the postoperative period. One due to MODS, two due to ARDS and two due to sepsis. More significantly, three of these patients were immunocompromised and had a past history of tuberculosis. The patients who died were all males belonging to the older age group

LIMITATIONS OF THE STUDY

As this study has been carried out over a limited period of time with a limited number of patients and there was lack of financial and infrastructural support, it could not have been large enough to be of reasonable precision. The follow up period was not long enough to comment about long term morbidity and mortality. More number of patients with abdominal tuberculosis especially those presenting early need to be analysed to determine the pathophysiology of the disease. All the facts and figures mentioned here may considerably vary from those of large series covering wide range of time, but still then, as the cases of this study were collected from a tertiary level hospital in our country, this study has some credentials in reflecting the facts regarding prevalence of abdominal tuberculosis and its varied mode of presentations.

SUMMARY

Abdominal Tuberculosis is a rapidly evolving cause of acute abdomen in developing countries like India. It poses a great diagnostic dilemma and the management protocols are also not defined. The increasing incidence of isolated abdominal tuberculosis with no evidence of systemic disease or pulmonary involvement adds to the difficulty in diagnosis. Moreover there is no clear cut data on the prognostic factors and the clinicoepediomology of the disease. This study tries to throw a light on few of those factors

Age and Sex Distribution :

Age is not a significant factor with patients equally distributed across all age groups. The preponderance of male patients can be explained by the fact that by nature they are the predominant gender and presence of additional risk factors like smoking, prevalence of immunocompromised status etc

Co Morbid Factors :

Diabetes Mellitus is the prevalent comorbid factor, seen epecially in the elderly. Other comorbid factors include hypertension, bronchial asthma etc. None of these seemed to have a significant correlation with the disease process. Previous history of tuberculosis and immunocompromised status do have a significant bearing on the disease process.

Diagnostic Studies :

Mantoux, Chest Xray and Sputum AFB were done to detect systemic disease. In a significant number of patients all these three tests turned out to be negative, making them unreliable in both diagnosis or excluding the disease. In emergency setting imaging by either USG or CECT Abdomen were not sensitive in diagnosing abdominal tuberculosis. They could indicate the presence of obstruction or perforation but specific findings to localise the cause is rarely seen.

Management :

In emergency setting, midline laparotomy to relieve the patient of his symptoms is the first goal. The common procedures performed included primary closure of perforation incase of small isolated perforations with not much contamination. Resection followed by either anastomosis or stomas was done in most of the patients. Even in those patients who had anastomosis, a covering stoma was placed as the healing process in these patients may be impaired.

Morbidity or Mortality :

The prevalence of morbidity in these patients were similar to any group of patients undergoing emergency laparotomy. There was no age or sex predilection. Presence of a systemic disease and immunocompromised patients had increased tendency to develop post operative morbidity and mortality. Overall, prognosis is good in patients provided with early intervention, intensive post operative management while ensuring the completion of course of anti tubercular drugs.

RECOMMENDATIONS

On the basis of the findings of the study, the following recommendations can be made:

1. Abdominal Tuberculosis should be a part of the differential for patients presenting with acute abdomen
2. Identification of the disease in its early stages, when the patients has only non specific symptoms is essential.
3. In immunocompromised patients or patients with pulmonary tuberculosis, any abdominal symptoms has to be properly evaluated.
4. The prognosis, if properly managed is very good, so proper management protocols need to be established
5. Further large scale studies have to be initiated to determine methods of early diagnosis and to reduce the morbidity of the disease.

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APPENDIX - I : ETHICAL COMMITTEE CLEAREANCE

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI-3

EC Reg No.ECR/270/Inst./TN/2013
Telephone No. 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To
Dr.S.Selvaraj
Postgraduate M.S.(General Surgery)
Madras Medical College
Chennai 600 003

Dear Dr.S.Selvaraj,

The Institutional Ethics Committee has considered your request and approved your study titled **"Abdominal Tuberculosis: Analysis of clinical features and outcome of surgical management in adult patients in RGGGH" No.06082015.**

The following members of Ethics Committee were present in the meeting held on 04.08.2015 conducted at Madras Medical College, Chennai-3.

1.	Prof.C.Rajendran, M.D.,	: Chairperson
2.	Prof.R.Vimala, M.D., Dean, MMC, Ch-3	: Deputy Chairperson
3.	Prof.Sudha Seshayyan, M.D., Vice-Principal, MMC, Ch-3	: Member Secretary
4.	Prof.B.Vasanthi, M.D., Professor Pharmacology, MMC	: Member
5.	Prof.A.Rajendran, M.S., Professor, Inst.of Surgery, MMC	: Member
6.	Prof.Saraswathy, M.D., Director, Inst. Of Pathology, MMC	: Member
7.	Prof.Srinivasagalu, Director, Inst.of Inter Med. MMC	: Member
8.	Tmt. J.Rajalakshmi, J.A.O. MMC, Ch-3	: Lay Person
9.	Thiru S.Govindasamy, B.A., B.L.,	: Lawyer
10.	Tmt.Arnold Saulina, M.A., MSW.,	: Social Scientist

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary, Ethics Committee
MEMBER SECRETARY
INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE
CHENNAI-600 003

Appendix-II

QUESTIONAIRE

PATIENT DETAILS:

Name: Age: Sex:

IP No. :

ON ADMISSION:

Main Complaints :

Abdominal Pain :

Bowel Habits :

Constitutional Symptoms :

Co – Morbid Illness :

Significant Past History :

Family / Exposure History :

CLINICAL EXAMINATION:

Pulse : BP :

RR : Temp :

Pallor : Icterus :

CVS : RS :

P/A :

INVESTIGATIONS :

CBC :

ESR :

Liver Function Test :

Renal Function Test :

Mantoux :

Sputum AFB :

CXR :

Xray LS Spine

Abdomen Xray :

USG Abdomen :

CECT Abdomen :

TREATMENT

OPERATIVE DETAILS :

Indication :

Intra Op findings :

Post op Period :

Biopsy (if done) :

Regimen given :

FOLLOW UP :

INFORMATION SHEET

TITLE : **"Abdominal Tuberculosis: Analysis of Clinical Features and Outcome of Surgical Management in Adult Patients in RGGGH"**

Name of Investigator : Dr. Selvaraj S. Name of Participant :

Purpose of Research : The purpose of the study is to analyse the various modes of presentation of abdominal tuberculosis, the common surgeries performed and the outcome of the surgery

Study Design : Prospective & Retrospective Observational Study

Study Procedures : Patient will be subjected to routine investigations, Xray, Usg, CECT Abdomen, Xray LS spine, Mantoux and Sputum for AFB & Operative Procedure as indicated, Biopsy, if done and the data analysed

Possible Risks : No risks to the patient

Possible benefits

To patient : A better understanding of their problem so has to devise a plan of management which suits their needs.

To doctor & to other people : If this study gives positive results, it can help determine the early identification, most effective diagnostic and treatment protocol for patients with abdominal tuberculosis. This will help in providing better and complete treatment to other patients in future.

Confidentiality of the information obtained from you : The privacy of the patients in the research will be maintained throughout the study. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared

Can you decide to stop participating in the study : Taking part in this study is voluntary. You are free to decide whether to participate in this study or to withdraw at any time

How will your decision to not participate in the study affect you : Your decision will not result in any loss of benefits to which you are otherwise entitled.

Signature of Investigator Signature of Participant

Date :

Place :

PATIENT CONSENT FORM

Study Detail	:	**"Abdominal Tuberculosis: Analysis of Clinical Features and Outcome of Surgical Management in Adult Patients in RGGGH"**
Study Centre	:	Rajiv Gandhi Government General Hospital, Chennai.
Patient's Name	:	
Patient's Age	:	
In Patient Number	:	

I confirm that I have understood the purpose of procedure for the above study. I have the opportunity to ask question and all my questions and doubts have been answered to my complete satisfaction. ❑

I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving reason, without my legal rights being affected. ❑

I understand that sponsor of the clinical study, others working on the sponsor's behalf, the Ethics committee and the regulatory authorities will not need my permission to look at my health records, both in respect of current study and any further research that may be conducted in relation to it, even if I withdraw from the study I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from this study. ❑

I agree to take part in the above study and to comply with the instructions given during the study and faithfully cooperate with the study team and to immediately inform the study staff if I suffer from any deterioration in my health or well being or any unexpected or unusual symptoms. ❑

I hereby consent to participate in this study ❑

I hereby give permission to undergo complete clinical examination and diagnostic tests including hematological, biochemical, radiological tests and to undergo treatment ❑

Signature/thumb impression	Signature of Investigator
Patient's Name and Address:	Study Investigator's Name: **Dr. SELVARAJ S.,**

Appendix – III

Statistical formula

A. Sample size:

To determine the sample size, this formula was used; $n = \frac{z^2 pq}{d^2}$

Where,

n = the desired sample size,

z = the standard normal deviate, usually set at 1.96 at 5% level,

which corresponds to 95% confidence level,

p = proportion of population, q

= 1- p

d = the degree of accuracy level considered as 5.0 %,

which assumes 0.05

If population size, N < 10,000 than the required sample size is very much smaller which was calculated by the following formula –

$$n_f = \frac{n}{1 + \frac{n}{N}}$$

Where,

n_f = the desired sample size, when population size, N < 10,000

n = the desired sample size, when population size, N > 10,000 N

= the roughly estimated population size.

B. Arrithmatic mean, $X = \frac{\sum fx}{N}$ (for grouped data)

C. Standard deviation , $SD = \sqrt{\frac{\sum (X - \bar{X})^2}{}}$

('O' indicates observed value and 'E' indicates expected value)

D. $$Z = \frac{P_1 - P_2}{\sqrt{\left[\frac{P_1 Q_1}{N_1} + \frac{P_2 Q_2}{N_2}\right]}}$$

P_1 indicates proportion in first group

P_2 indicates proportion in second group

$Q_1 = 100 - P_1$

$Q_2 = 100 - P_2$

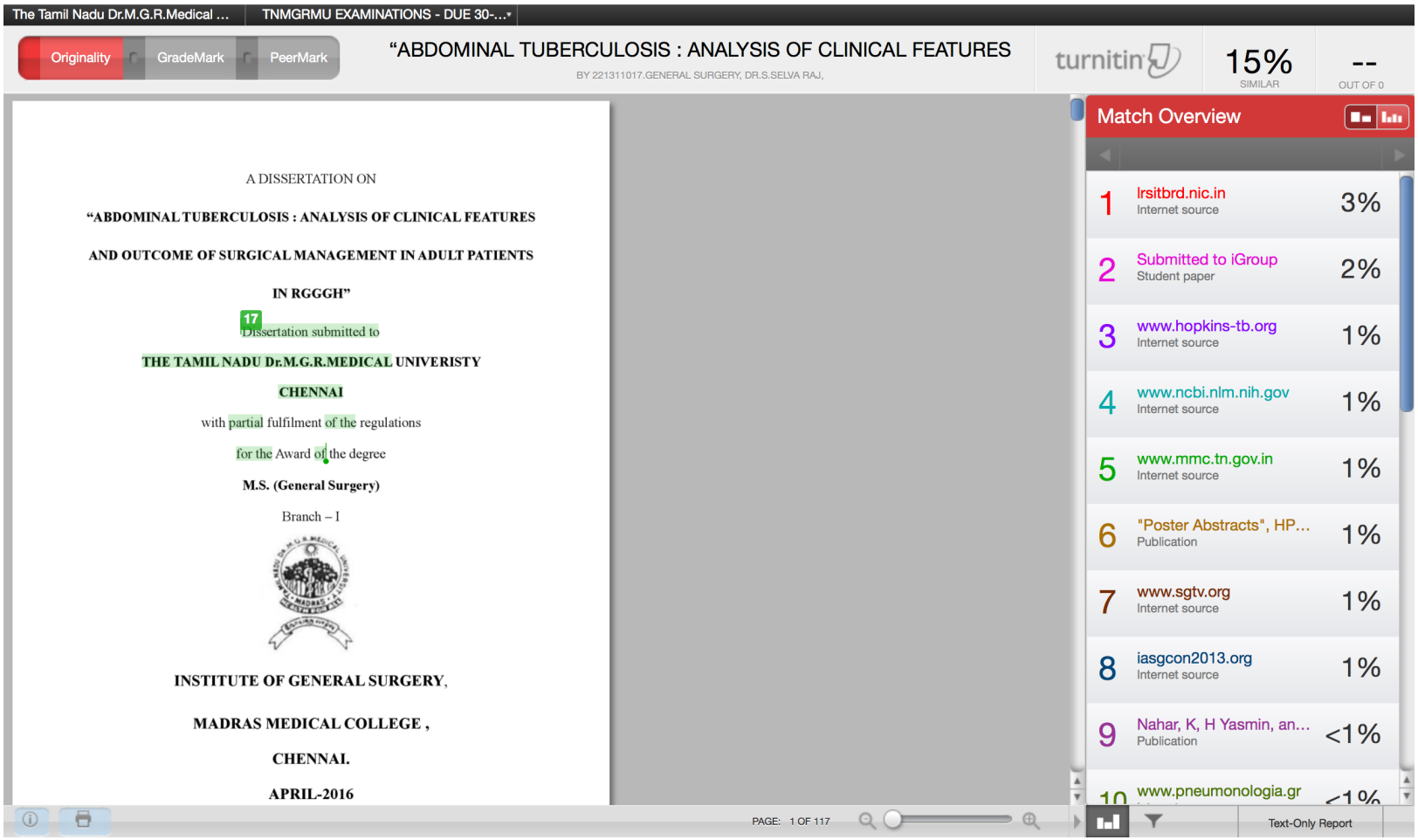
N_1 indicates sample size of first group

N_2 indicates sample size of second group.

E. $$SD = \sqrt{\frac{\sum (X - \bar{X})}{(N-1)}}$$

Here, $\bar{X}$ indicates mean value
X indicates individual value
N indicates sample

APPENDIX IV - - PLAGIARISM



APPENDIX V — MASTER CHART

S. No.	Name	Age	Sex	Co-Morbidity	Previous ATT	CXR	Mantoux	Sputum AFB	SBP	PR	Hb	TC	Urea	Na+	K+	Diagnosis				Operative Procedure	HPE	Post op Comp	Cause of Death
																Obst	Perf	Mesen	Ascitis				
1	kosalai	52	F	DM	-	-	-	-	140	90	9.8	10,400	9	135	3.4	-	+	-	+	PC	AFB	WD	-
2	lakshmi	38	F	-	-	-	+	-	90	128	10.6	6,800	7	145	4.7	-	+	Nod	+	Res with DI	CA	WD	-
3	bhagavathi	24	F	-	-	-	+	-	110	132	11	13,800	8.3	139	4.3	+	-	-	-	SP	NS	WI	-
4	dharan	22	M	-	-	-	-	-	130	98	13.7	11,000	6.5	139	4	-	+	-	+	Res with DI	EG	-	-
5	durai	32	M	HIV	+	+	+	+	90	124	13	9,700	12	129	4.4	+	-	-	-	RA with LI	EG	WD	-
6	sarvesh	18	M	-	-	-	-	-	100	96	12	11,800	6	139	4.5	-	+	Tub	+	PC	AFB	-	-
7	kameela	52	F	HTN	-	-	+	-	110	106	9.2	9,000	8	135	4.1	-	+	-	+	Res with EI	EG	-	-
8	vasugi	39	F	-	+	+	+	+	110	96	11.6	25,000	7	140	4.8	-	+	-	+	Res with EI	EG	WI	-
9	fathima	25	F	-	-	-	-	-	120	108	11	13,900	6.5	142	4.7	+	-	-	-	RA with LI	EG	-	-
10	mathivanan	55	M	DM	-	-	+	-	90	96	8.8	10,800	7.8	141	3.3	-	+	N&T	+	PC	AFB	AL	-
11	kamaal	45	M	-	-	-	-	-	110	98	10.9	21,900	6	138	3.7	+	-	Tub	+	Res with EI	AFB	-	-
12	udhayadasan	56	M	HIV	-	+	+	+	94	102	11.2	5,300	12	125	2.8	+	-	-	-	Res with DI	EG	-	MODS
13	saran	27	M	-	-	-	-	-	100	98	12	15,600	5.5	142	4.6	-	+	-	+	Res with DI	EG	-	-
14	shakuth	37	M	-	-	-	+	+	84	112	10.8	4,600	9	135	5.8	-	+	-	+	PC	AFB	PE	-
15	vasantha	38	F	-	-	-	+	-	100	98	11.6	7,800	6.2	138	4.7	-	+	N&T	+	Res with DI	CA	-	-
16	madhavi	38	F	-	-	-	+	-	96	122	11.4	5,700	5.5	144	4.2	+	-	N&T	-	Res with DI	CA	WI	-
17	revathi	39	F	HIV	+	+	+	+	114	102	12.6	5,200	6.2	133	3.6	-	+	-	+	Res with DI	EG	Pne	-
18	rajalakshmi	34	F	-	-	-	-	-	110	112	11.8	23,000	7	138	4.8	+	-	-	+	Res with EI	EG	WI	-
19	subhash	42	F	-	-	-	+	+	90	110	11.9	6,700	5.7	142	6	-	+	-	+	PC	NS	WD	-
20	fazil	54	M	DM	-	+	+	+	84	116	12.4	5,800	6	148	5.3	+	-	Tub	-	RA with LI	CA	PE	-
21	mahendran	44	M	-	-	-	+	+	90	104	12.6	6,500	7	139	5.5	-	+	Nod	+	PC	AFB	At	-
22	venkattamma	48	F	-	-	-	-	-	110	114	10.8	22,000	6.2	142	5.3	-	+	Nod	+	PC	CA	-	-
23	graham	29	M	HIV	-	+	+	+	104	122	11.8	8,000	7	136	3.8	-	+	-	+	Res with EI	EG	Pne	-
24	preethi	38	F	-	-	-	+	-	122	108	11.4	23,500	8	139	5.4	-	+	Tub	+	Res with DI	CA	-	-
25	rasheed	42	M	-	+	+	+	+	110	98	13	22,000	7.5	143	4.5	+	-	Tub	+	Res with DI	CA	-	-
26	rajini	25	M	-	-	-	+	-	130	110	14	9000	10	138	3.9	+	-	N&T	-	RA with LI	CA	WI	-
27	kolanji	59	F	CAD	-	-	+	-	130	98	10	5,500	12	144	4.2	+	-	Nod	-	RA with LI	CA	-	-
28	devaraj	55	M	HIV	-	+	+	+	110	102	13	12,800	9	141	3.5	-	+	-	+	Res with EI	EG	-	ARDS
29	pushpalatha	42	F	DM	-	-	+	+	120	80	10.2	9,800	7	140	3.9	-	+	-	+	Res with EI	EG	At	-
30	jayapal	45	M	-	-	-	-	-	100	97	13	11,800	11	137	3.3	-	+	-	+	PC	AFB	-	-

31	manohar	42	M	-	-	-	+	-	90	104	10.2	13,300	10	133	3.5	+	-	-	-	RA with LI	EG	WD	-
32	dhanasekar	52	M	HTN	+	+	+	+	90	110	12	5,800	6	135	3.9	-	+	-	+	Res with DI	AFB	-	-
33	raheem	29	M	-	-	-	-	-	100	112	13	6,900	8	134	4.2	-	+	Tub	+	Res with EI	CA	-	-
34	krishnamoorthy	51	M	-	-	-	+	+	110	104	14	5,600	10	139	4.4	+	-	-	-	SP	NS	-	-
35	ambikapathy	27	M	-	-	-	+	+	90	112	13	12,500	9	133	5.2	-	+	-	+	PC	NS	At	-
36	sakkarapani	52	M	-	+	+	+	+	94	104	11	8,700	12	140	5.1	-	+	-	+	Res with DI	EG	-	-
37	kanimozhi	32	F	HTN	-	-	+	+	140	96	11.4	8,800	11	133	3.6	+	-	N&T	-	Res with DI	AFB	-	-
38	vasu	33	M	-	-	+	+	+	110	95	14	6,900	9	138	3.9	-	+	-	+	Res with EI	EG	-	-
39	perumal	55	M	-	-	-	-	-	130	87	14	7,800	15	133	3.4	-	+	Tub	+	PC	CA	-	-
40	vaaruni	44	F	DM	-	-	+	+	140	96	12	10,600	7	135	3.5	-	+	Tub	+	Res with DI	AFB	WI	Sepsis
41	madhan	29	M	-	-	-	-	-	120	90	12	8,800	6	133	4	+	-	-	-	RA with LI	EG	-	-
42	gandhi	45	M	-	-	-	+	-	100	94	12	9,900	12	140	3.7	-	+	-	+	PC	NS	-	-
43	karuppaiah	58	M	DM	-	-	-	-	160	104	9.8	7,800	15	134	3.2	-	+	Tub	+	Res with DI	CA	-	ARDS
44	neelakandan	55	M	-	-	-	+	-	90	98	10	6,600	11	138	3.8	-	+	-	+	Res with DI	EG	-	-
45	parudhi	24	M	-	-	-	+	+	110	98	13	10,200	9	134	3.9	+	-	-	-	SP	NS	-	-
46	ramesh	49	M	-	-	-	+	-	150	88	11	13,700	12	140	4.6	-	+	-	+	PC	NS	AL	-
47	aarumugam	45	M	-	-	-	-	-	130	94	13	12,800	9	139	3.3	-	+	-	+	Res with DI	EG	-	-
48	mani	29	M	-	+	+	+	+	130	91	14	9,800	8	138	4.2	+	-	Tub	-	RA with LI	CA	-	-
49	kavilaya	19	F	-	-	-	-	-	130	94	11	7,800	6	140	3.5	-	+	Tub	+	PC	CA	-	-
50	raju	33	M	DM	-	-	+	+	140	98	12	8,800	7	139	3.8	-	+	-	+	PC	NS	-	-
51	ashok	40	M	-	-	-	+	-	130	90	13	12,800	10	138	3.9	+	-	-	-	RA with LI	EG	-	-
52	anitha	36	F	-	+	+	+	+	90	104	9.6	5,500	9	133	4	+	-	N&T	+	Res with DI	CA	WD	-
53	kodeeswaran	42	M	-	-	+	+	+	130	93	15	6,600	10	138	4.2	+	-	N&T	+	Res with DI	CA	-	-
54	vedha	32	F	-	-	-	-	-	80	100	8	5,500	10	133	4.6	-	+	Nod	+	Res with EI	CA	At	-
55	damodhar	32	M	-	+	+	+	+	110	92	13.6	8,700	5	142	3.6	+	-	N&T	-	Res with DI	CA	-	-
56	vasanth	18	M	-	-	-	+	-	130	98	14	10,200	7	141	3.9	-	+	-	+	Res with DI	EG	At	-
57	kaliyamoorthy	40	M	HIV	-	+	+	+	120	92	13	7,200	6	136	3.9	+	-	Nod	+	Res with DI	CA	AKI	Sepsis
58	pandiyarajan	48	M	DM	-	-	-	-	110	84	12.6	13,000	11	134	4	-	+	N&T	+	Res with DI	CA	-	-
59	sakunthala	40	F	-	-	-	+	-	136	102	7.4	13,800	11	130	5.4	-	+	Nod	+	Res with DI	CA	WD	-
60	kathirvel	52	M	DM/HTN	-	-	-	-	180	88	13.4	5,800	7	148	5.3	+	-	-	-	RA with LI	EG	AKI	-

KEY :

DM - - Diabetes Mellitus
SHT / HTN - - Systemic Hypertension
AFB - - Acid Fast Bacilli
CAD - - Coronary Artery Disease
HIV - - Human Immunodeficiency Virus
TB - - Tuberculosis
SBP - - Systolic Blood Pressure
PR - - Pulse Rate
GCS - - Glasgow Coma Scale
Hb - - Hemoglobin
TC - - Total Count
Obst - - Obstruction
Perf - - Perforation
Nod - - Nodal Involvement
Tub - - Tubercles in mesentry and bowel surface
N & T - - Both Nodes and Tubercles
EG - - Epitheloid Granuloma
CA - - Caseating Adenitits
PC - - Primary Closure
RA with LI - - Resection anastomosis with Loop Ileostomy
Res with EI - - Resection with End Ileostomy
Res with DI - - Resection with Double Barrel Ileostomy
WI - - Wound Infection
WD - - Wound Dehiscence
At - - Basal Atelectasis
AL - - Anastomotic Leak
DE - - Dyselectrolytemia
DVT - - Deep Vein Thrombosis
MODS - - Multi Organ Dysfunction Syndrome
ARDS - - Acute Respiratory Distress Syndrome